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United States Patent [19]

DiRisio

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[45] **Date of Patent: Dec. 26, 2000**

[54] **CAMERA WITH FRAME SHIFT PREVENTION DURING EXPOSURE**

[75] Inventor: **Anthony DiRisio**, Rochester, N.Y.

[73] Assignee: **Eastman Kodak Company**, Rochester, N.Y.

[21] Appl. No.: **09/283,420**

[22] Filed: **Apr. 1, 1999**

[51] **Int. Cl.**[7] **G03B 17/02**

[52] **U.S. Cl.** **396/6**; 396/399; 396/440

[58] **Field of Search** 396/395, 397, 396/399, 400, 440, 6

[56] **References Cited**

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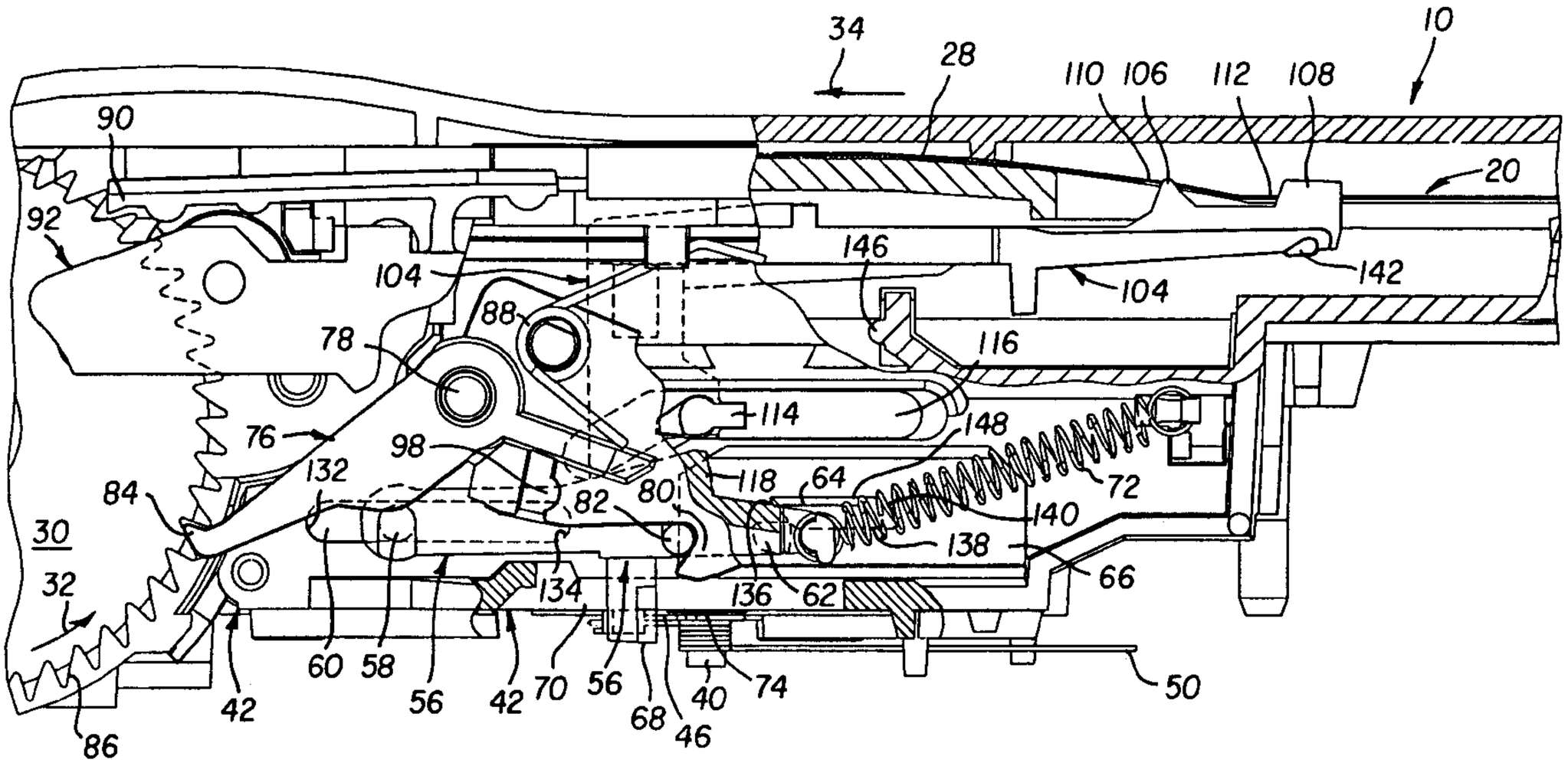
Primary Examiner—David M. Gray

Attorney, Agent, or Firm—Roger A. Fields

[57] **ABSTRACT**

A camera comprising a main body part with spaced film supply and film take-up chambers and an exposure opening located between the film supply and take-up chambers and configured for exposing an unexposed film frame, a metering pawl for engaging a film perforation during exposure of the film frame at the exposure opening, and a film winding take-up for moving an exposed frame in a film take-up direction from the exposure opening to the film take-up chamber, is characterized in that the metering pawl is supported to engage a film perforation between the exposure opening and the film supply chamber during exposure of a film frame at the exposure opening, and a tensioning spring urges the metering pawl substantially opposite to the film take-up direction in order to tension a film frame at the exposure opening. Since the film length between the metering pawl and the film winding take-up is longitudinally tensioned, the film frame is similarly tensioned at the exposure opening. Thus, the film tensioning positively acts to prevent frame shift during exposure of the film frame.

5 Claims, 22 Drawing Sheets



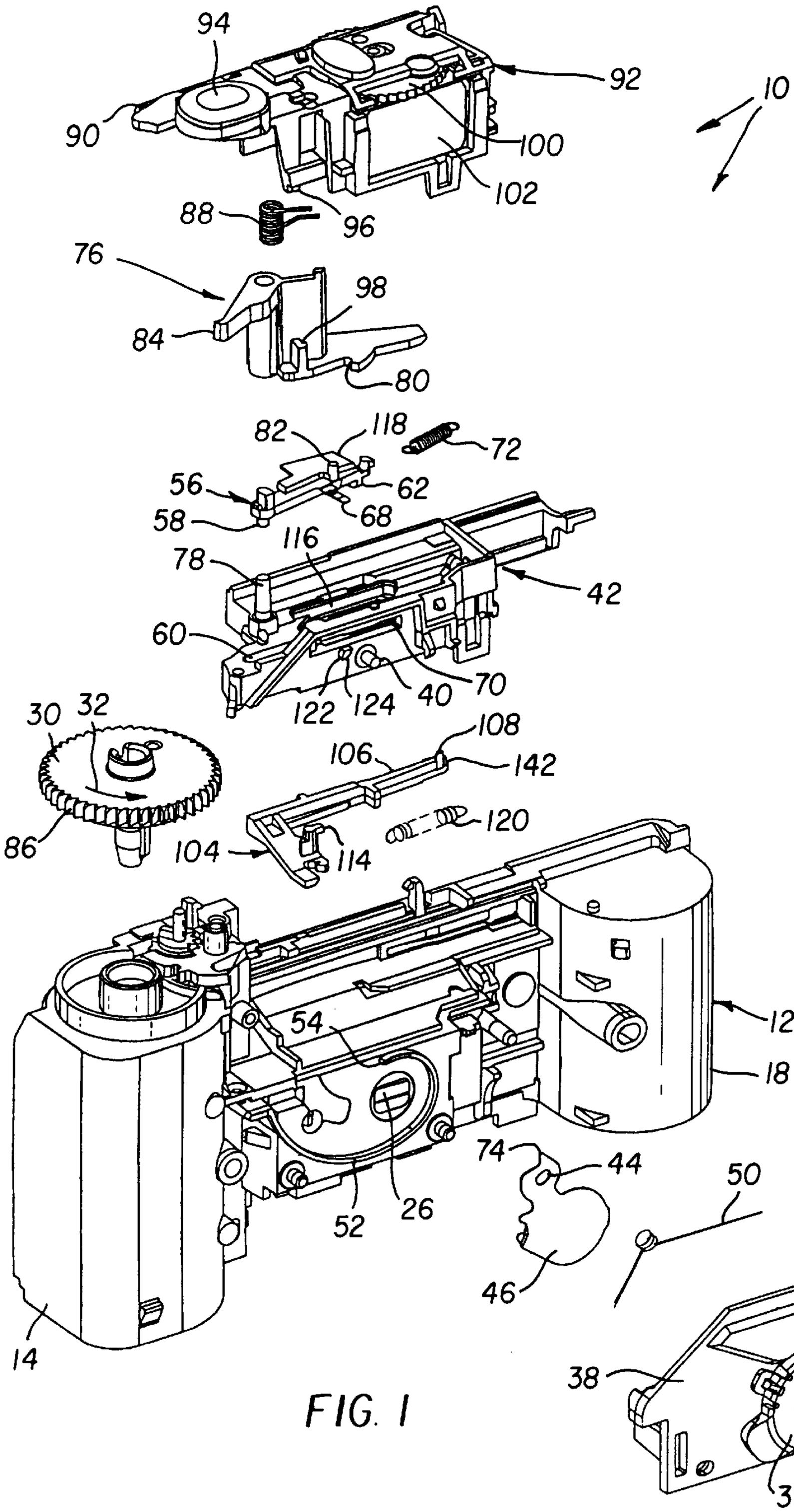

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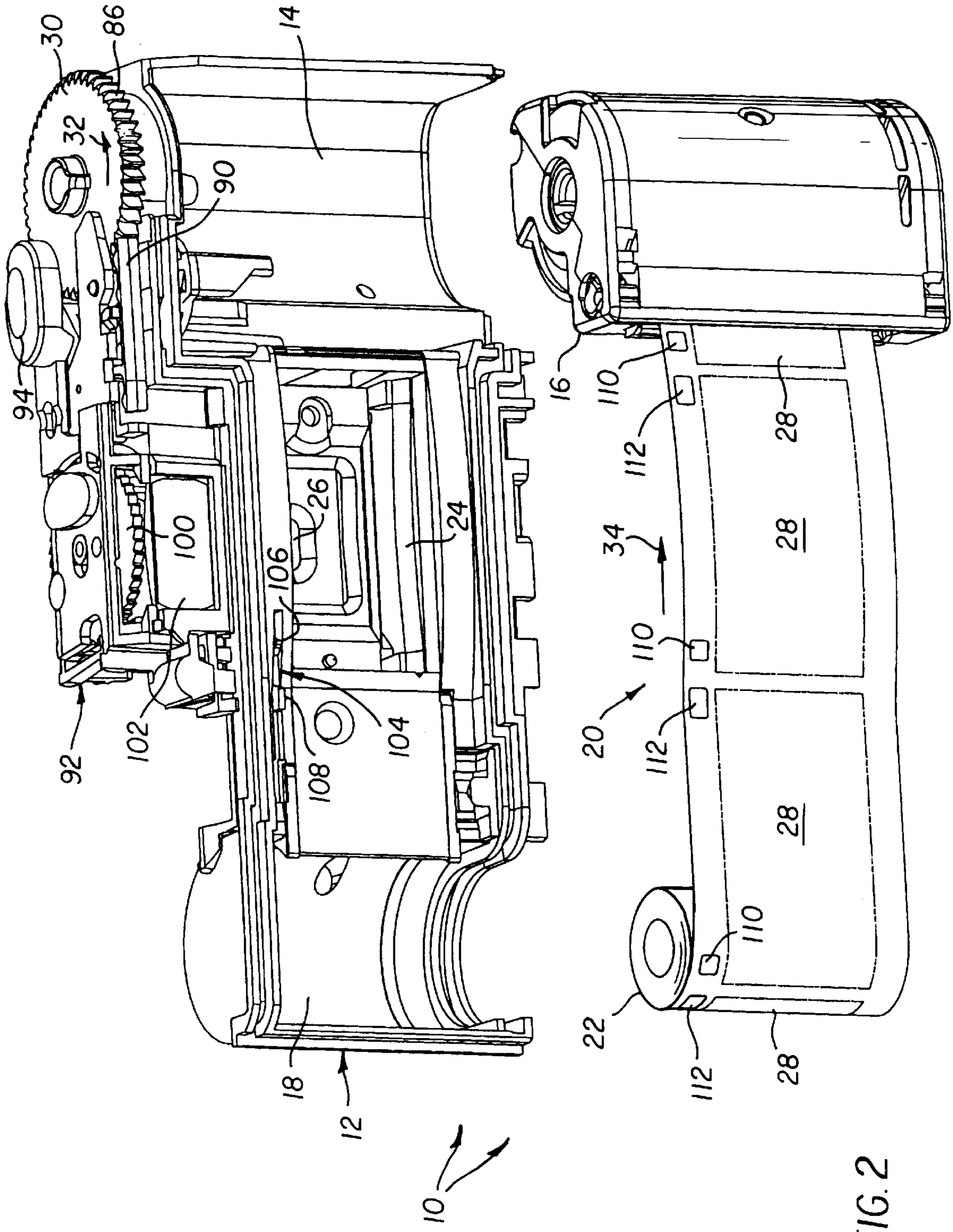
FIG. 1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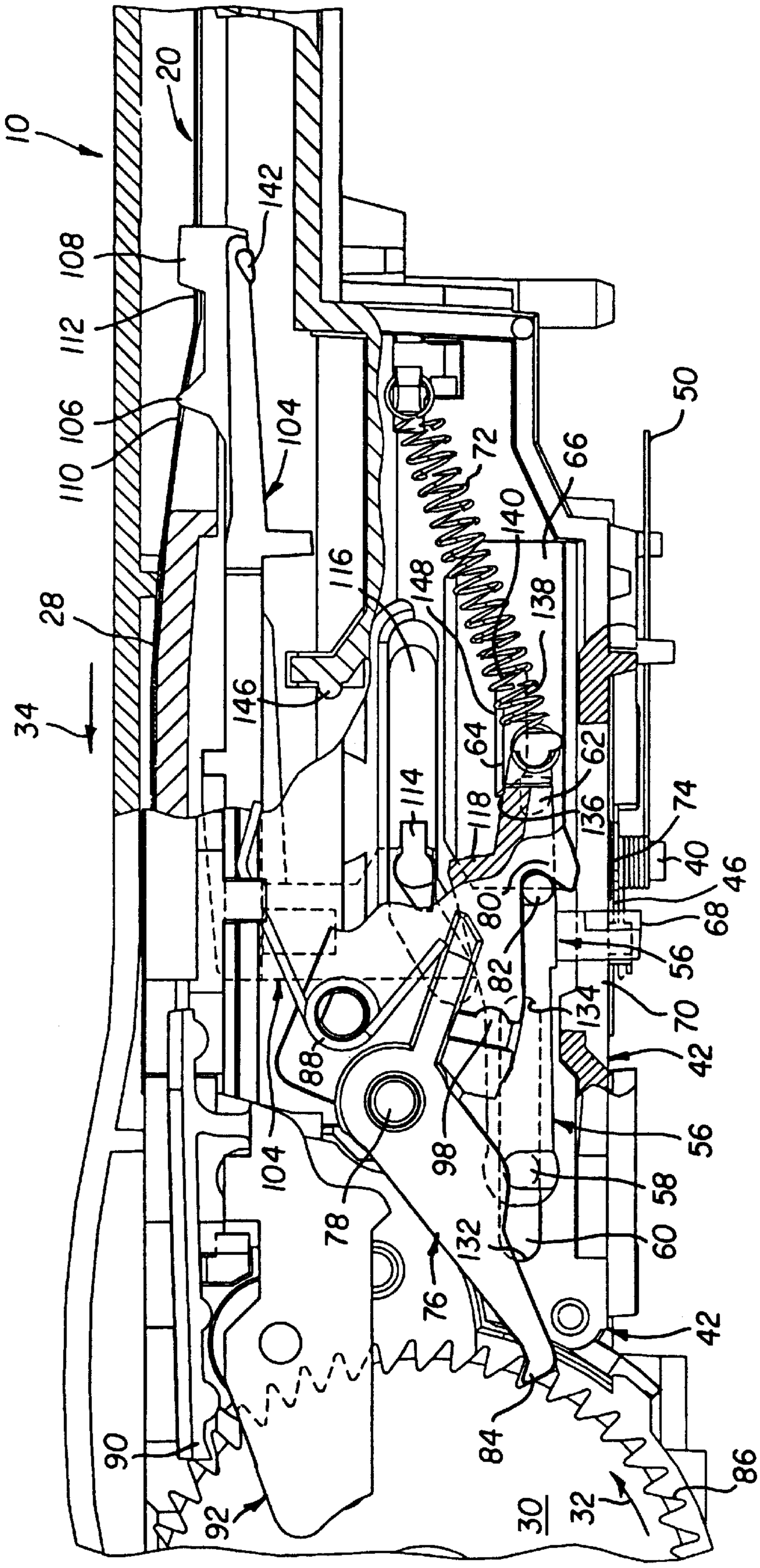
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FIG. 3

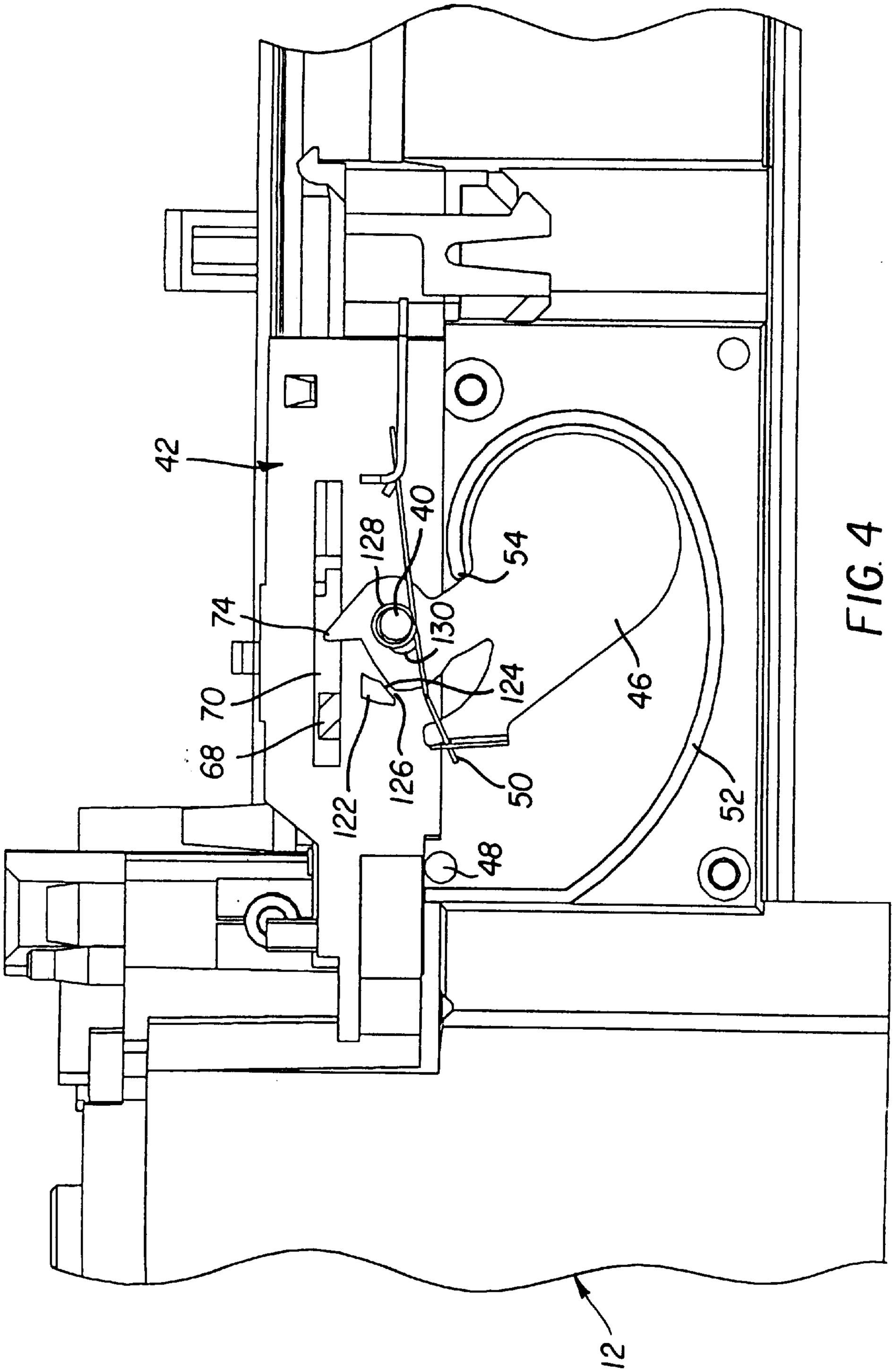
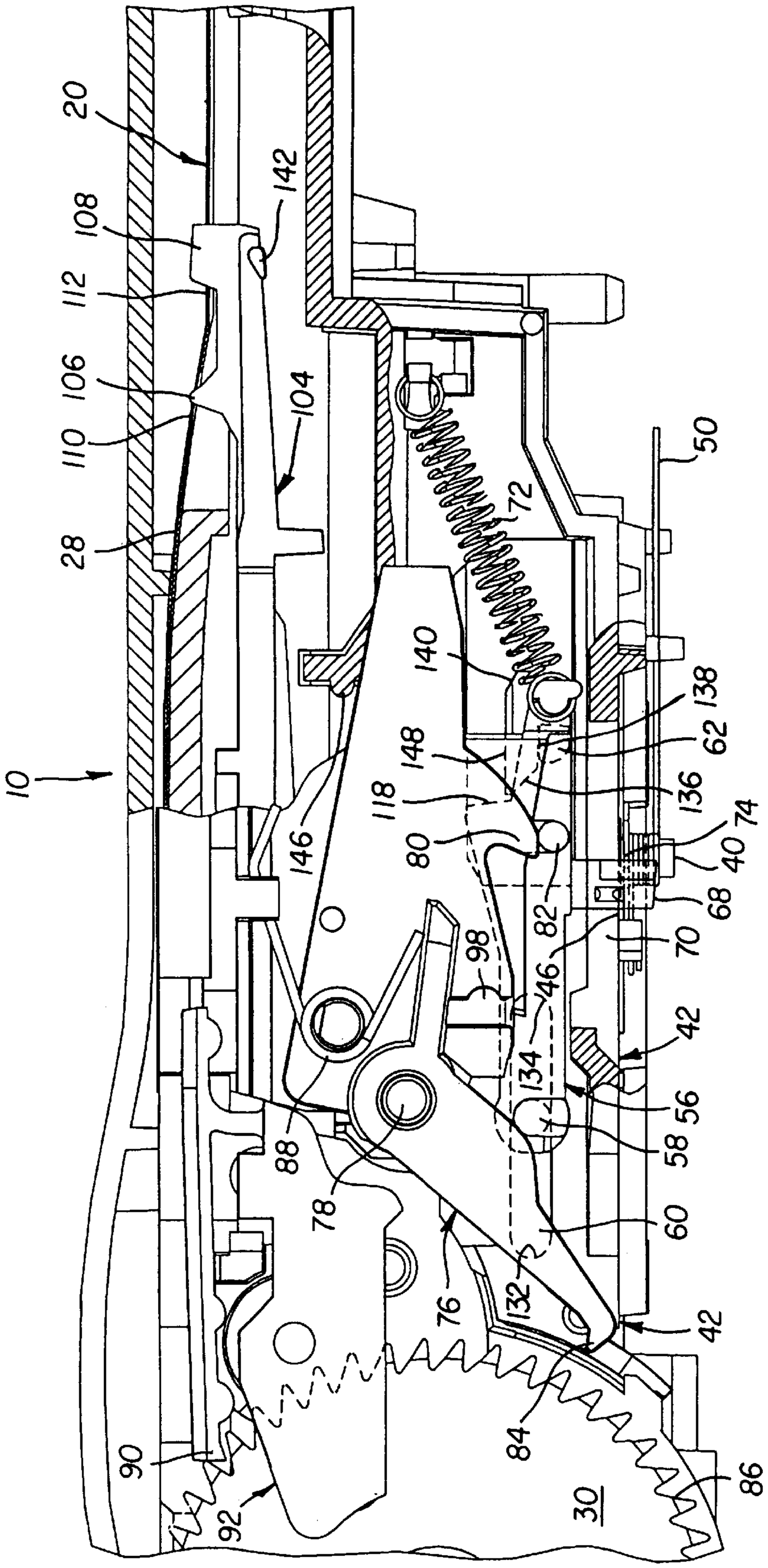


FIG. 4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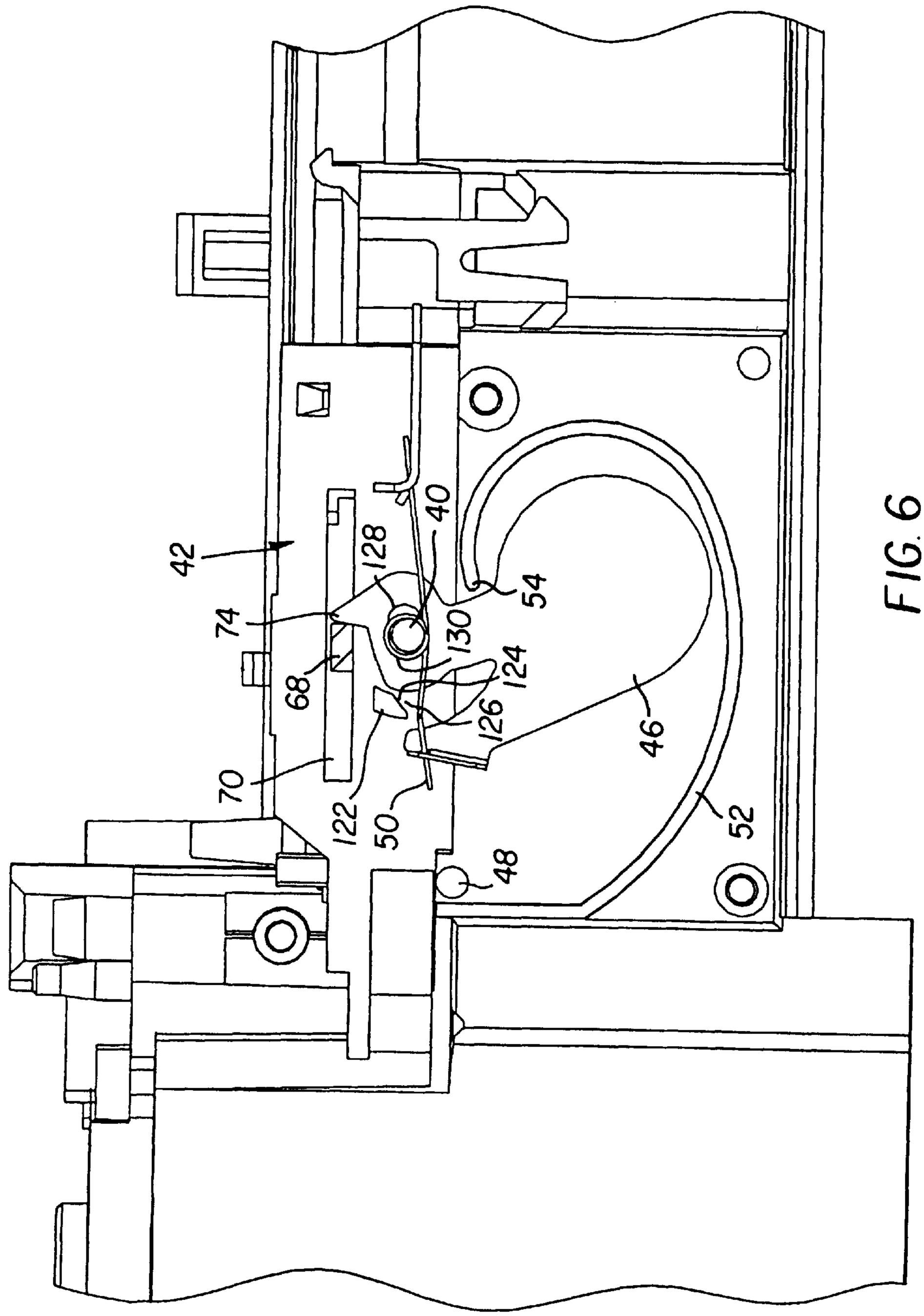

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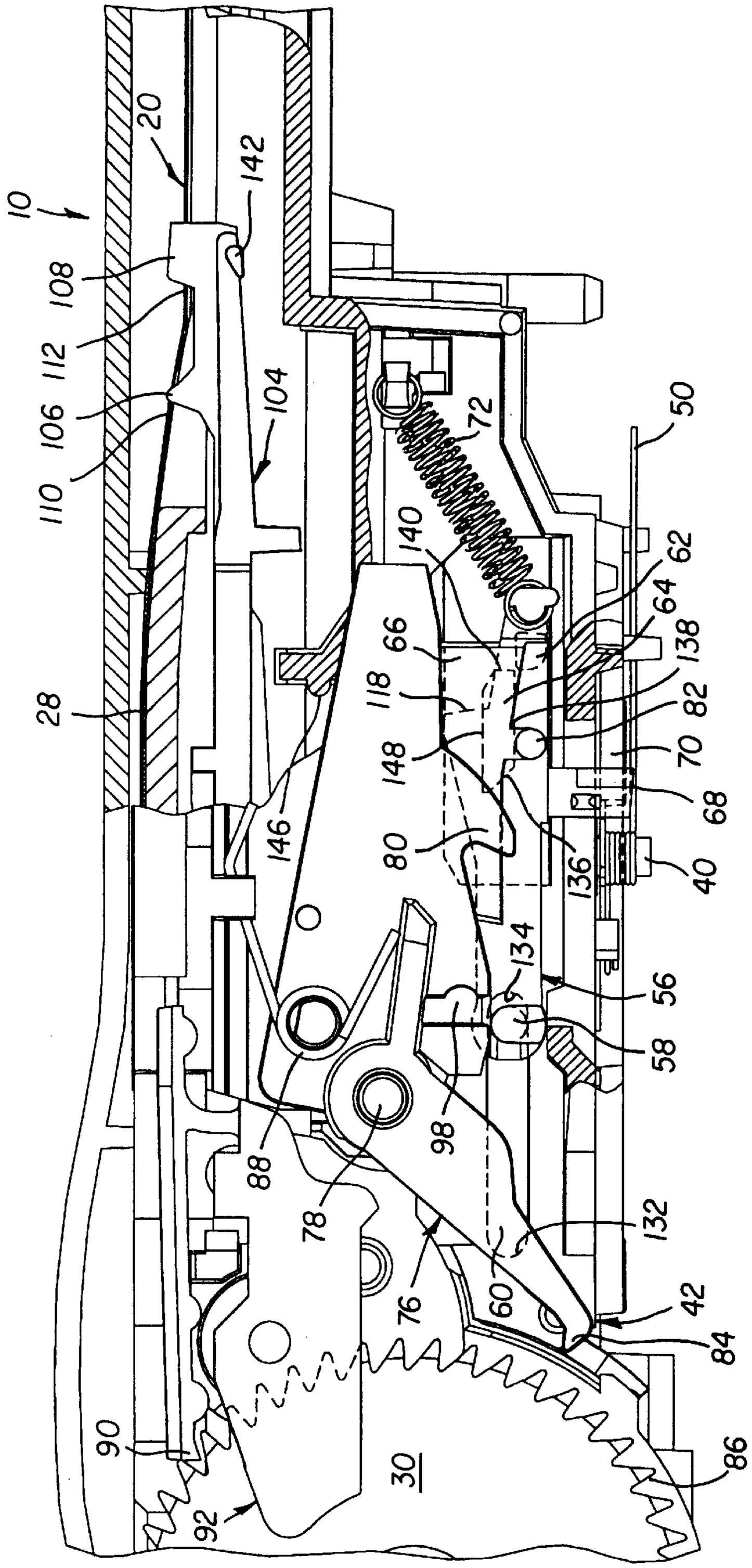
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FIG. 7

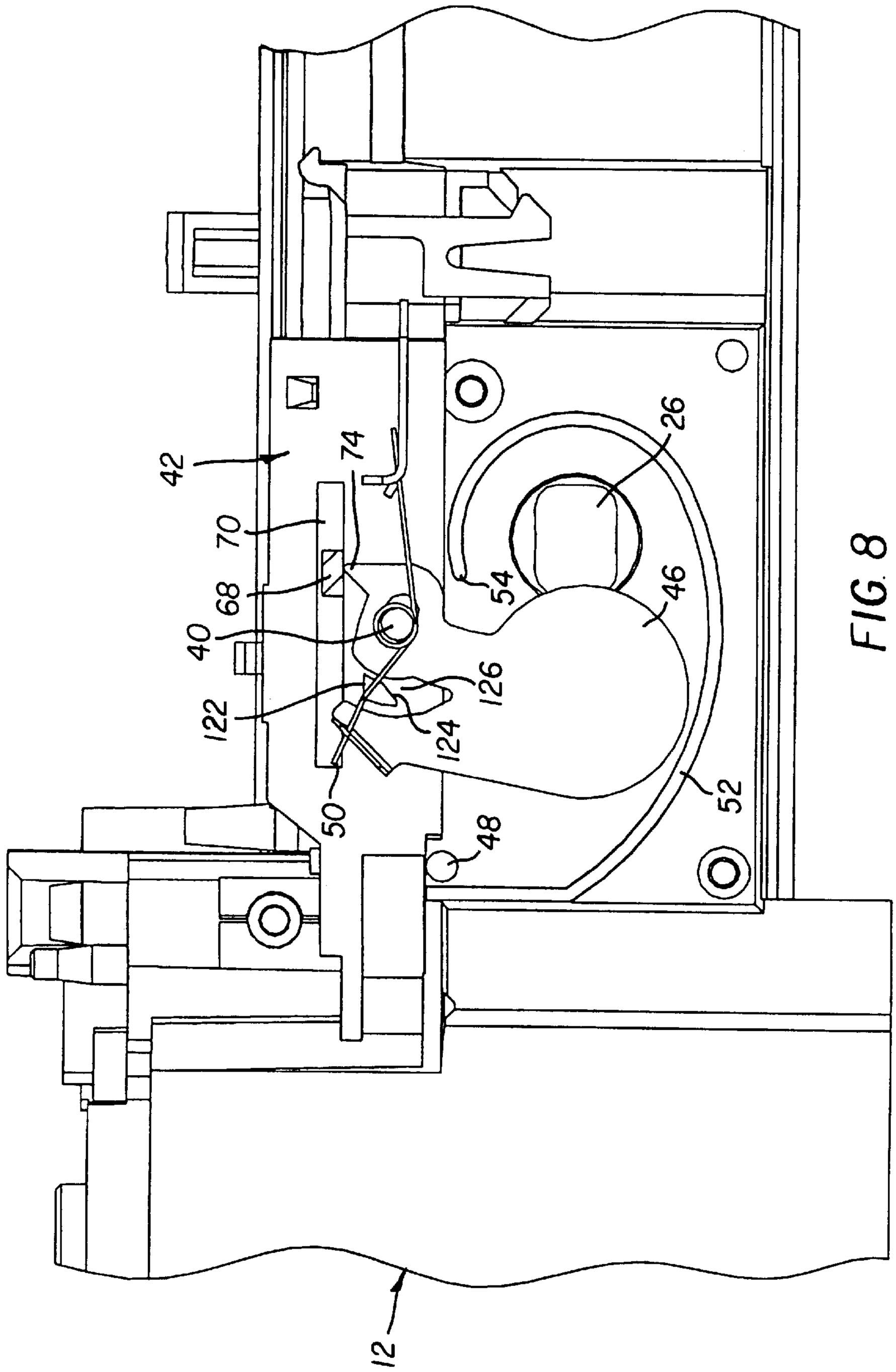

FIG. 8

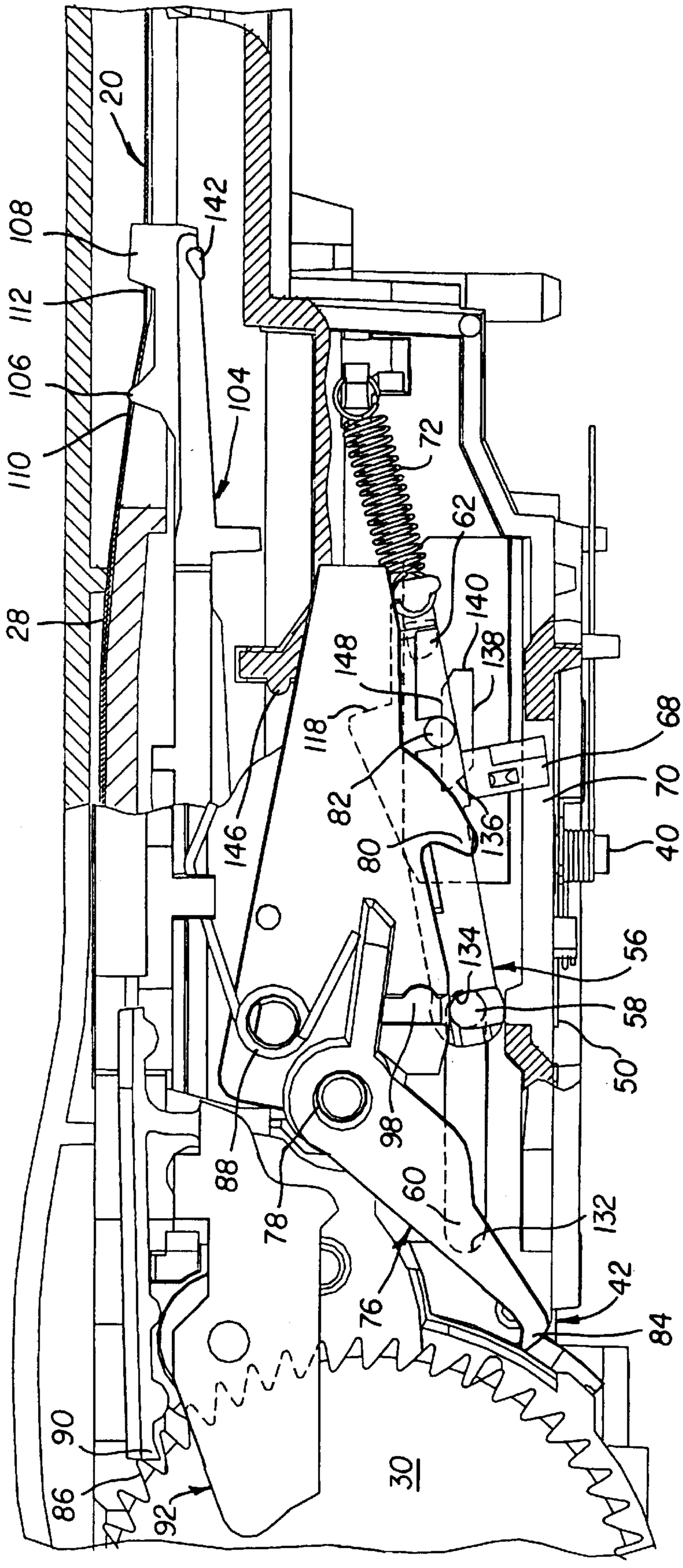
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FIG. 9

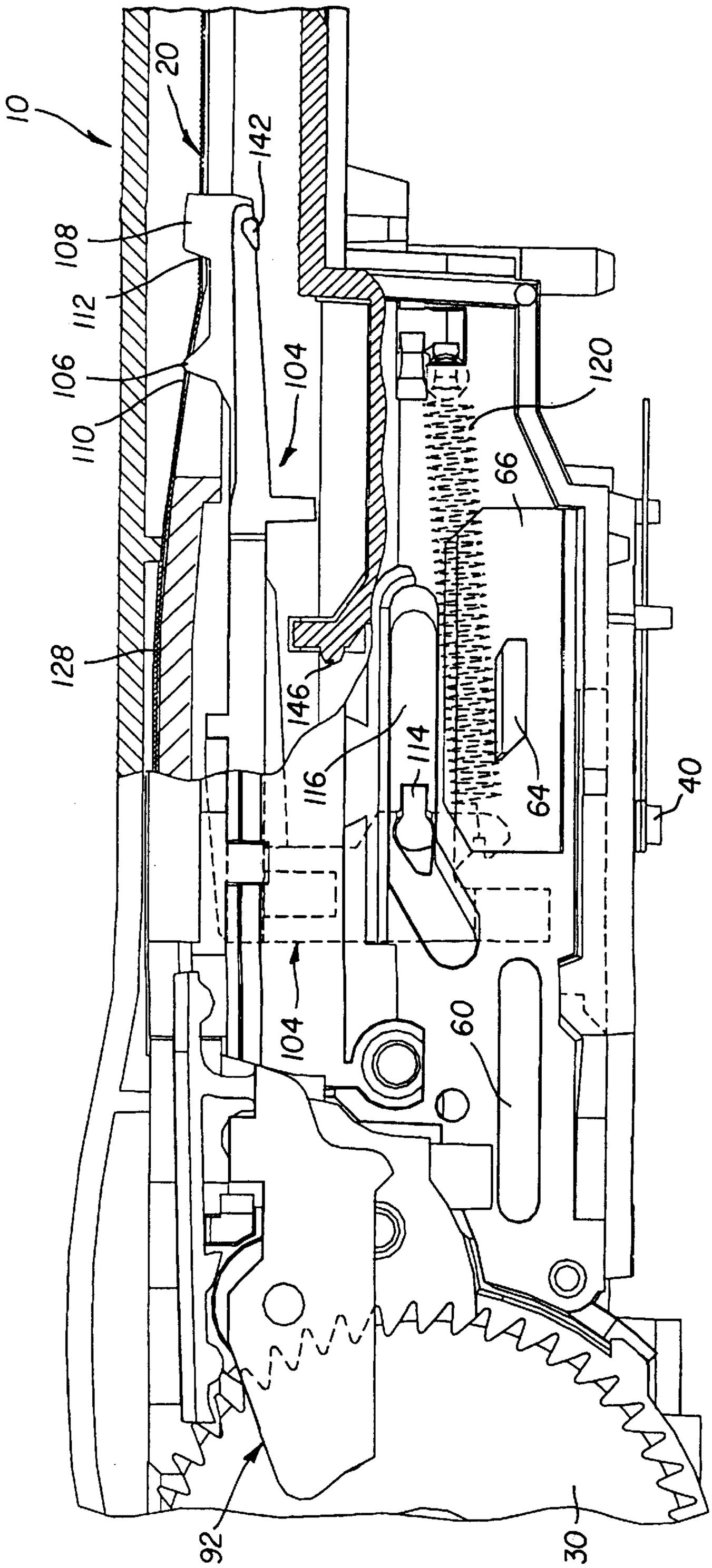
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FIG. 10

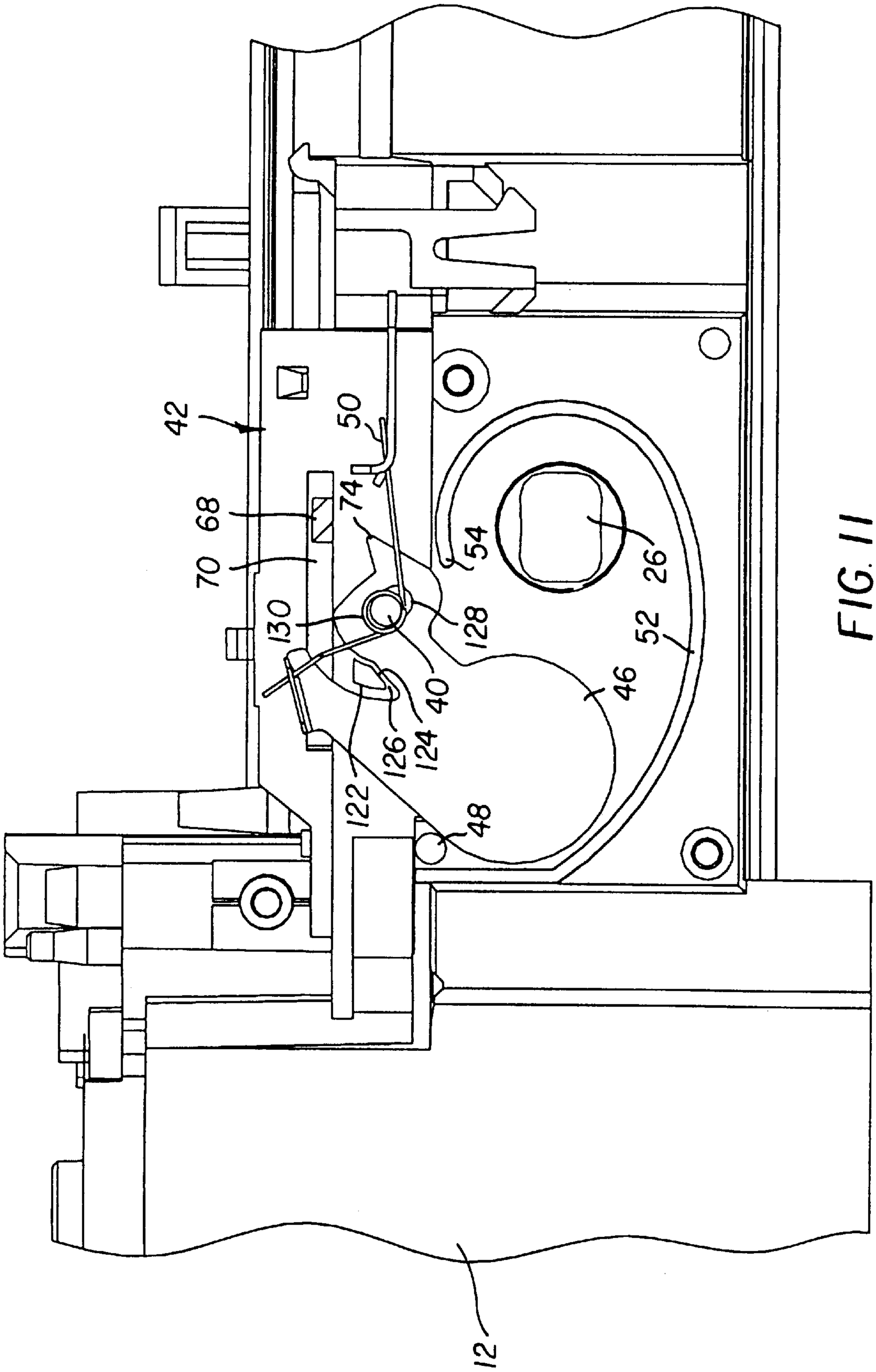

FIG. 11

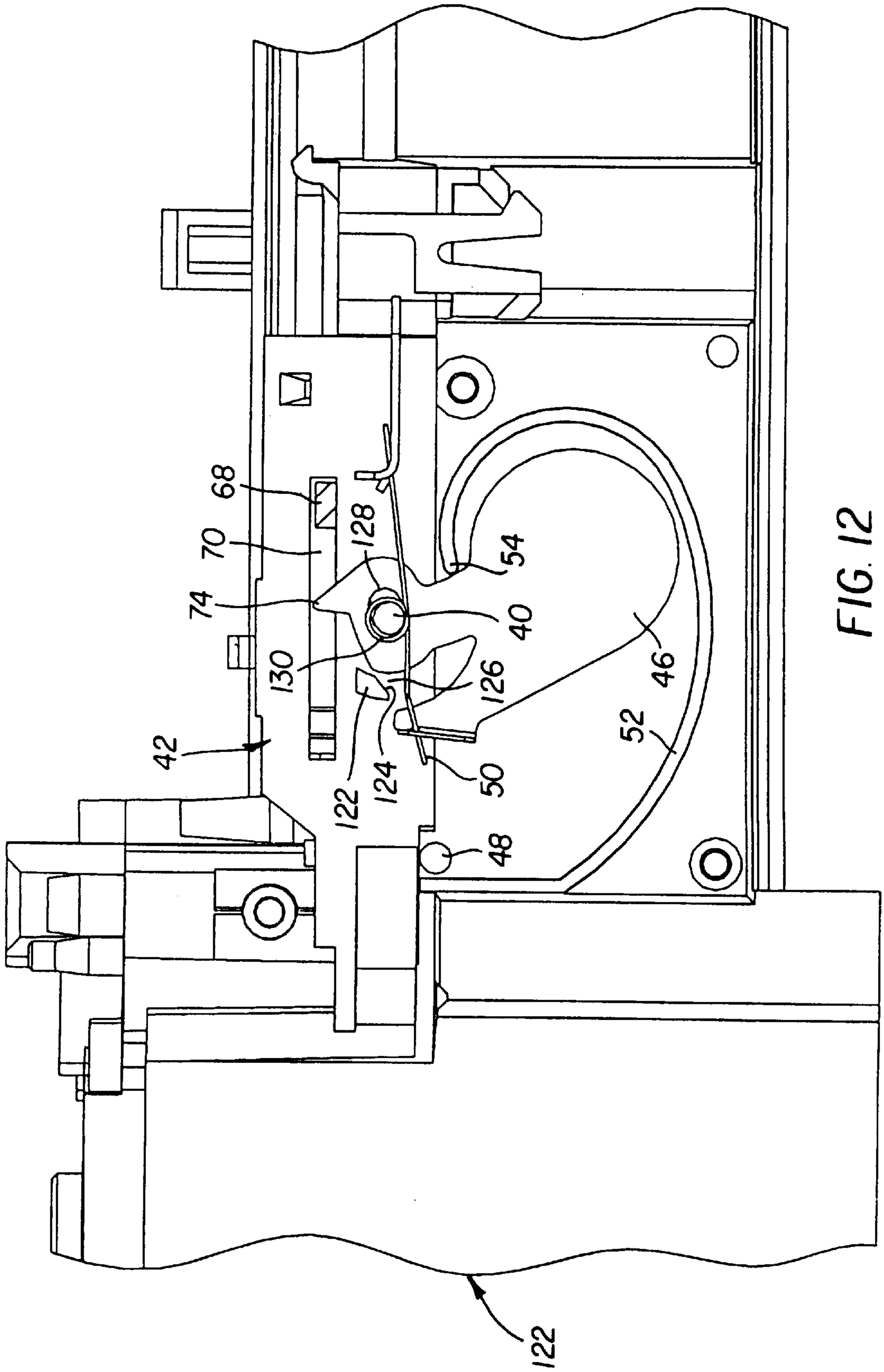

FIG. 12

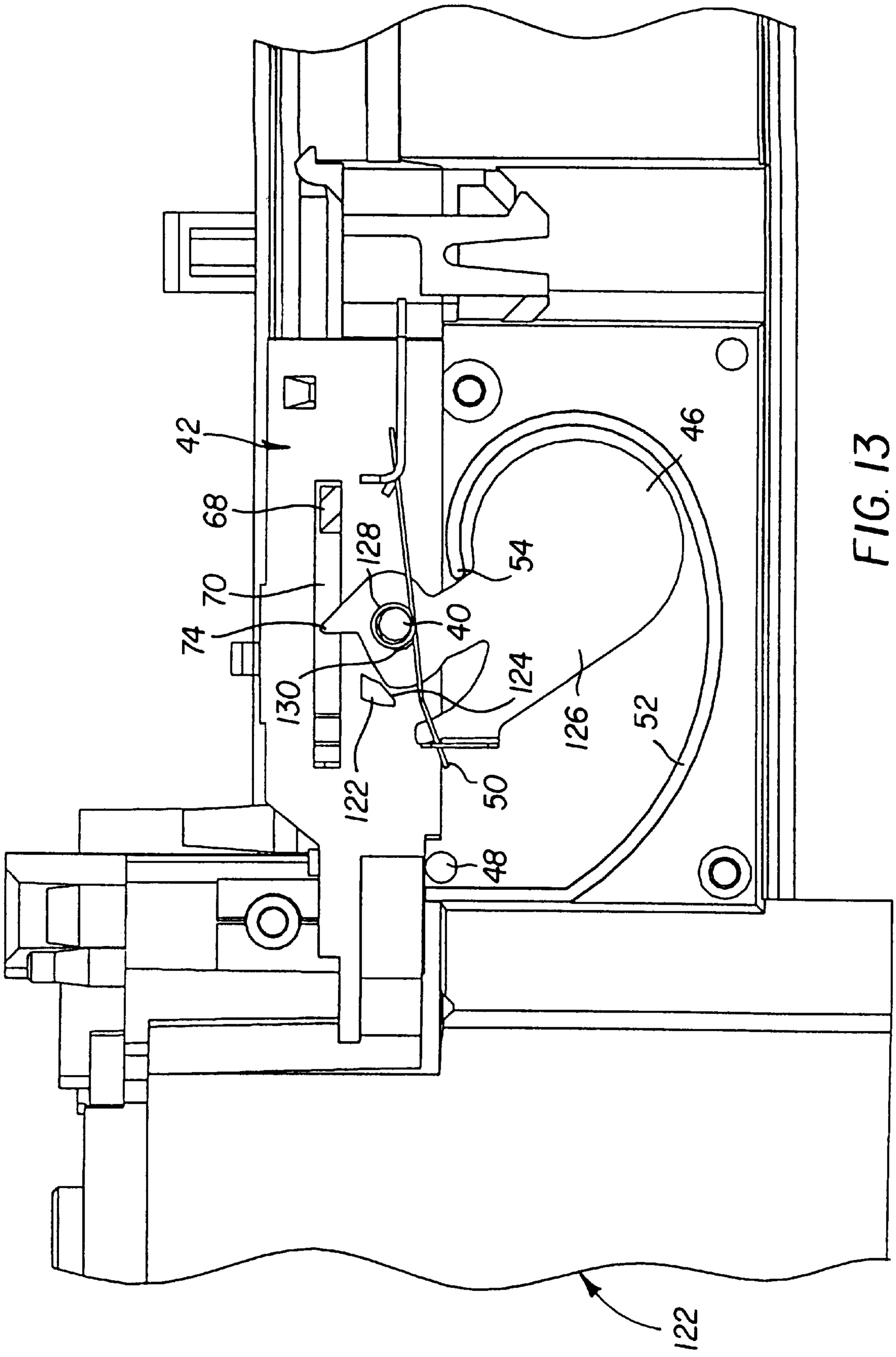

FIG. 13

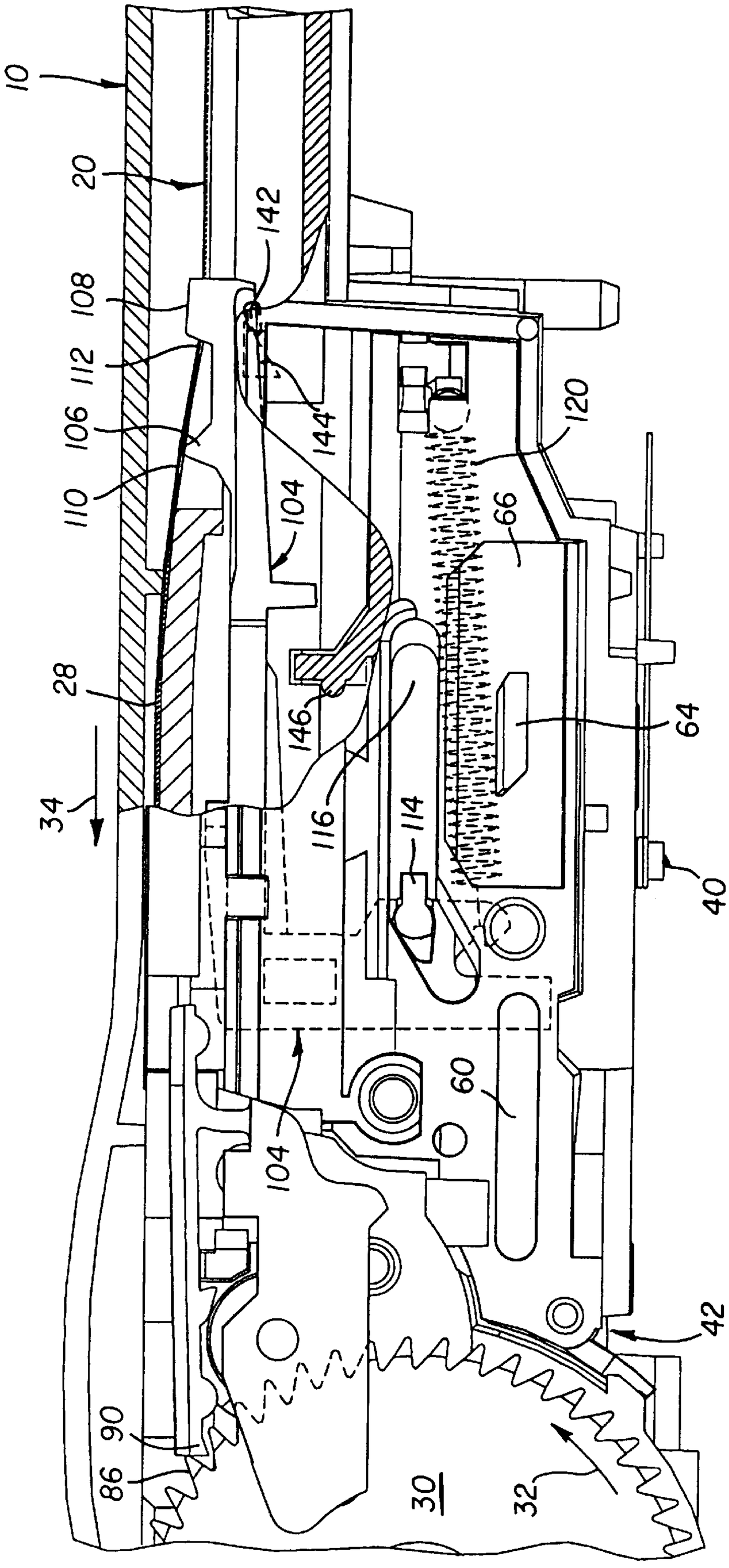
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FIG. 14

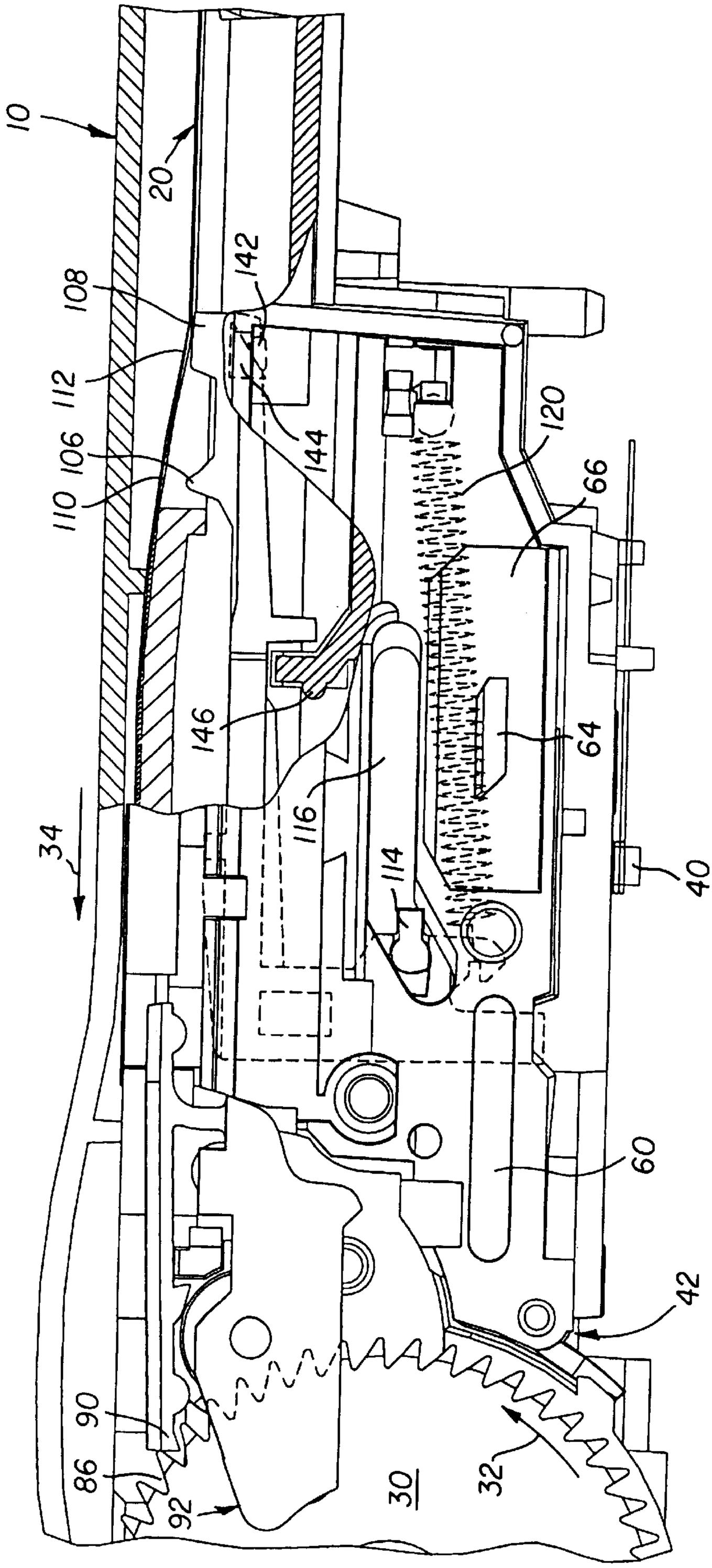
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FIG. 15

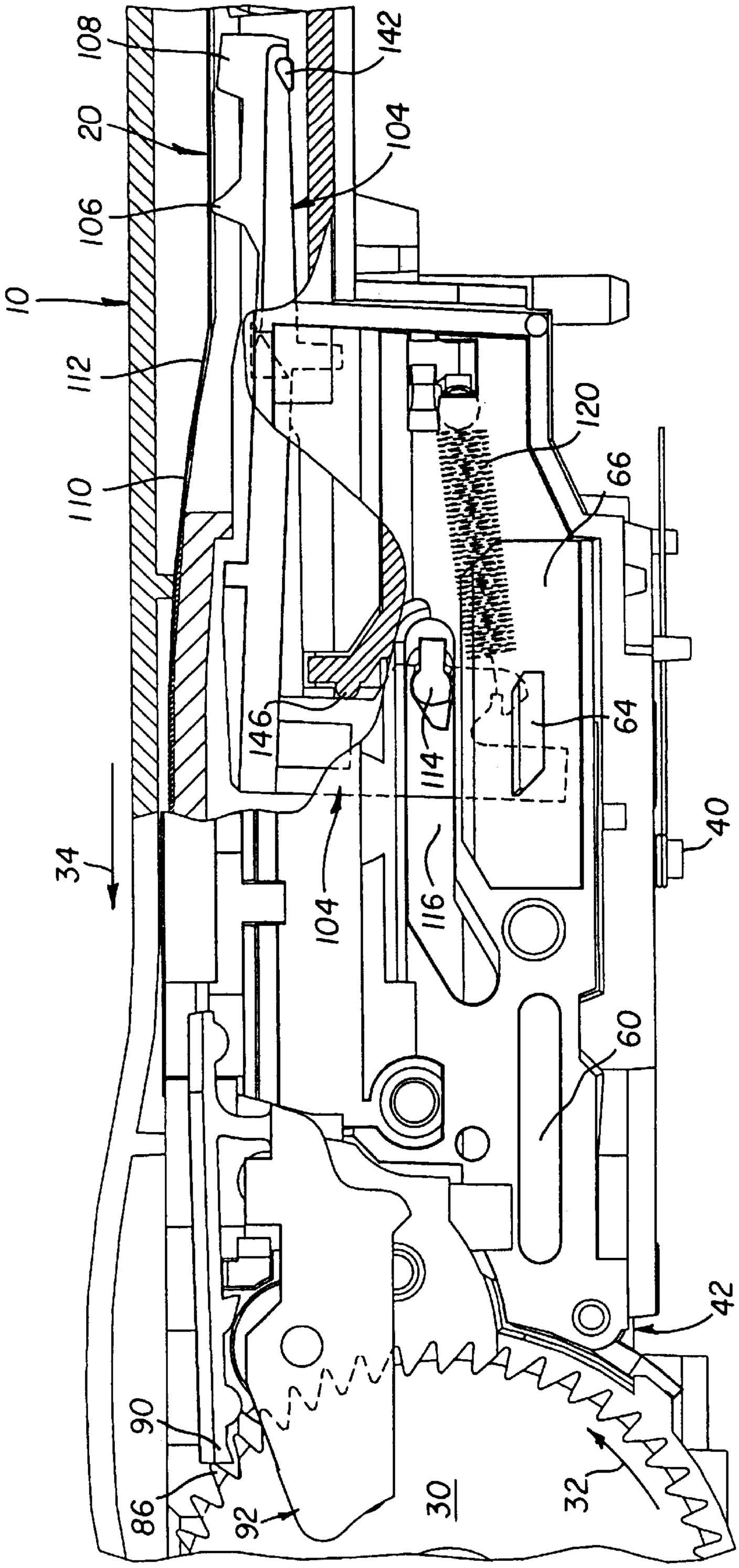
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FIG. 16

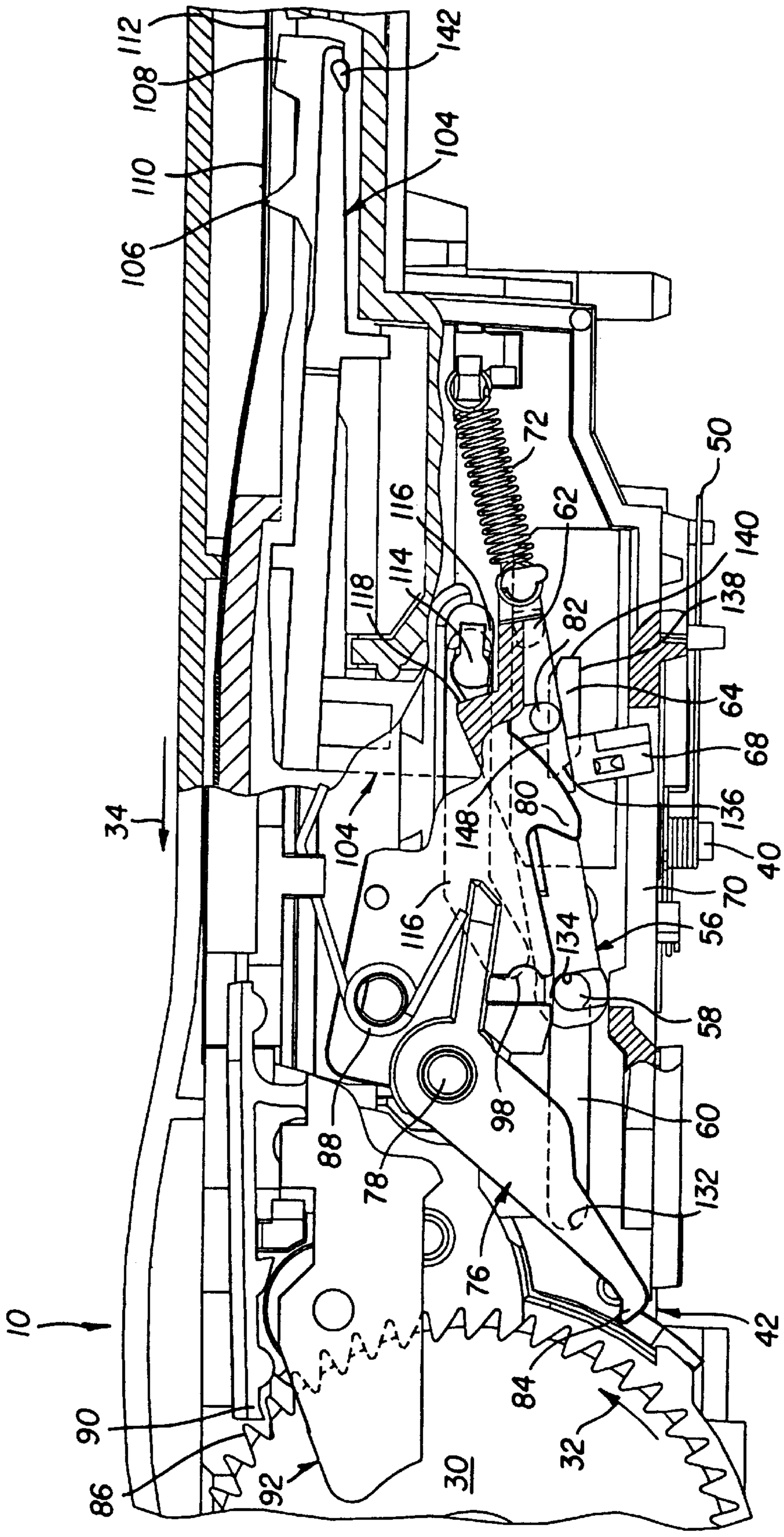
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FIG. 17

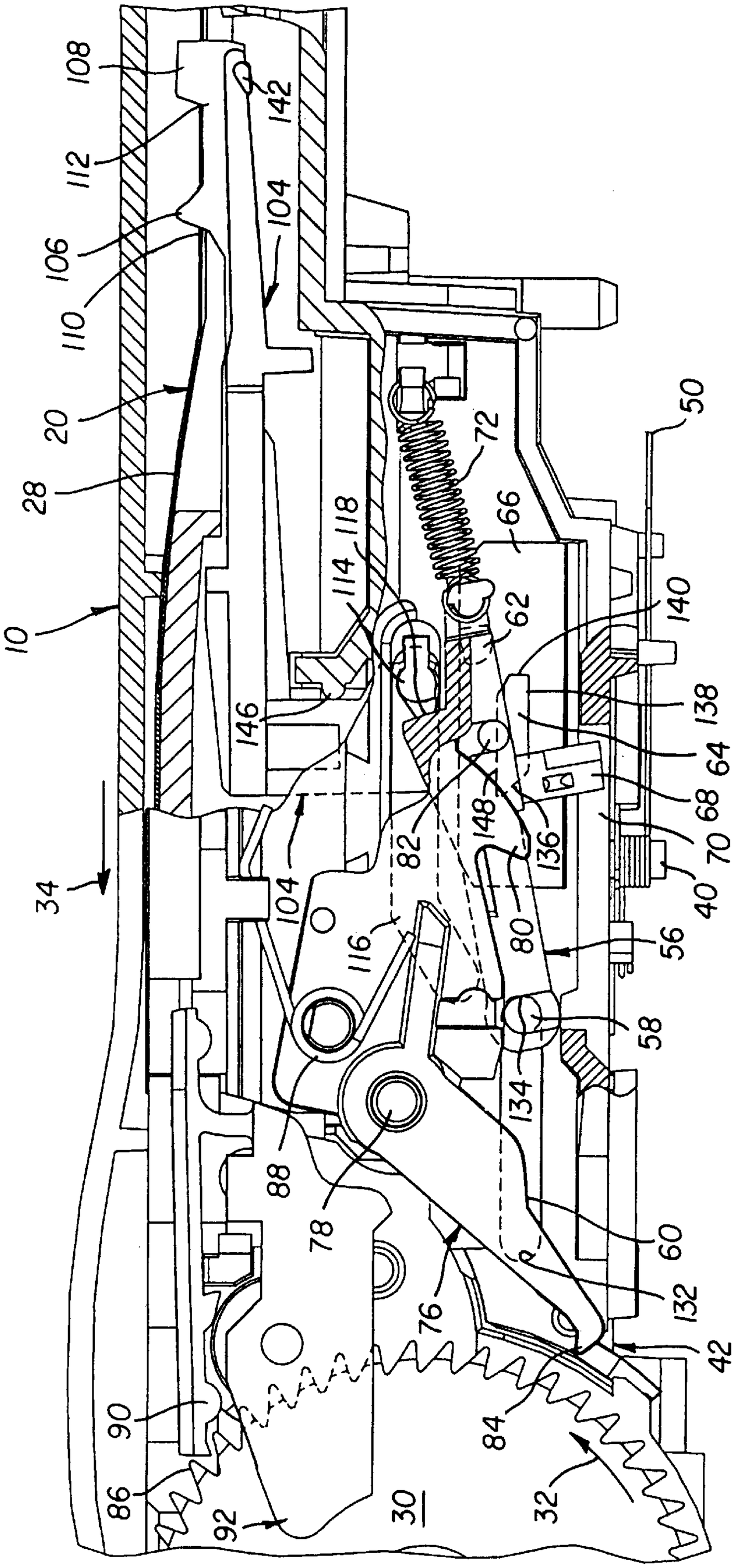
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FIG. 18

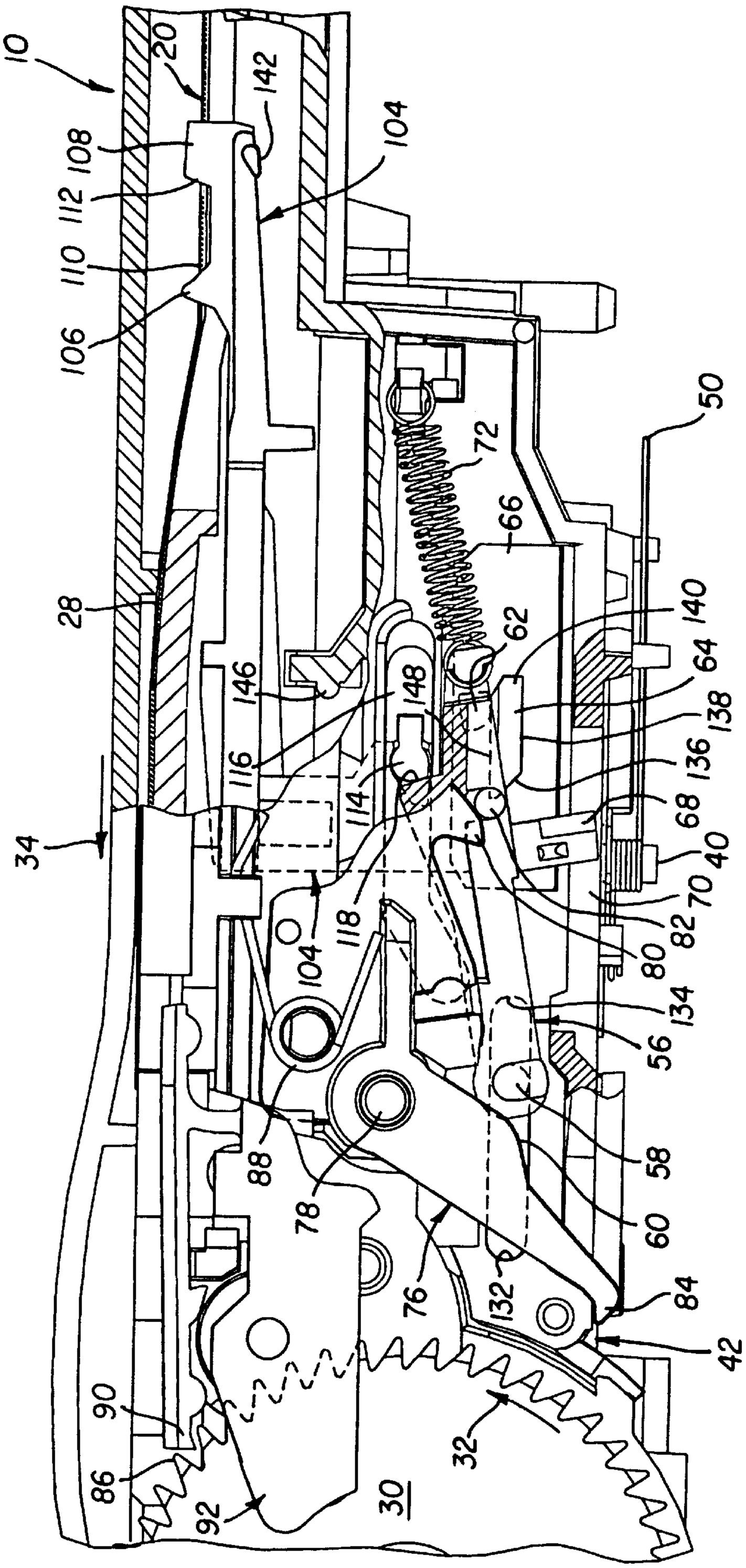
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FIG. 19

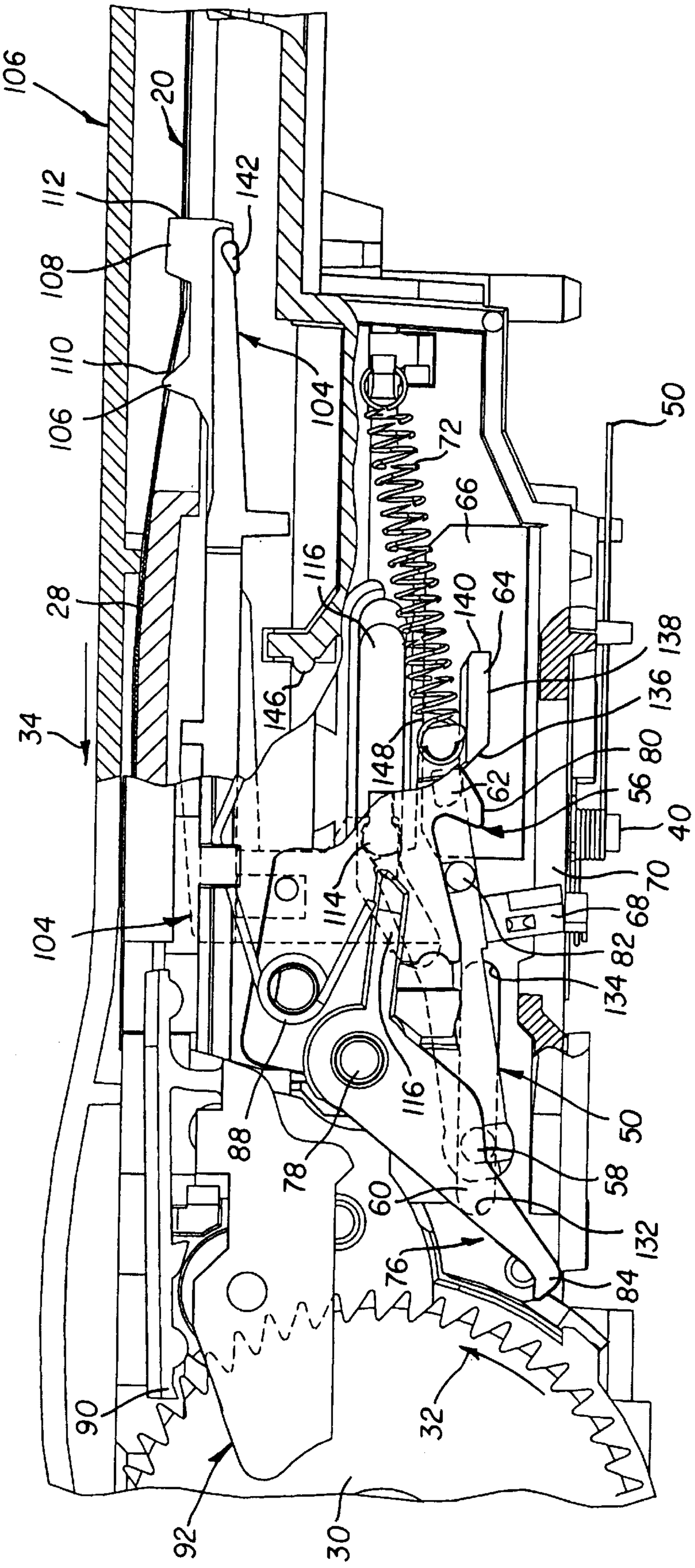
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FIG. 20

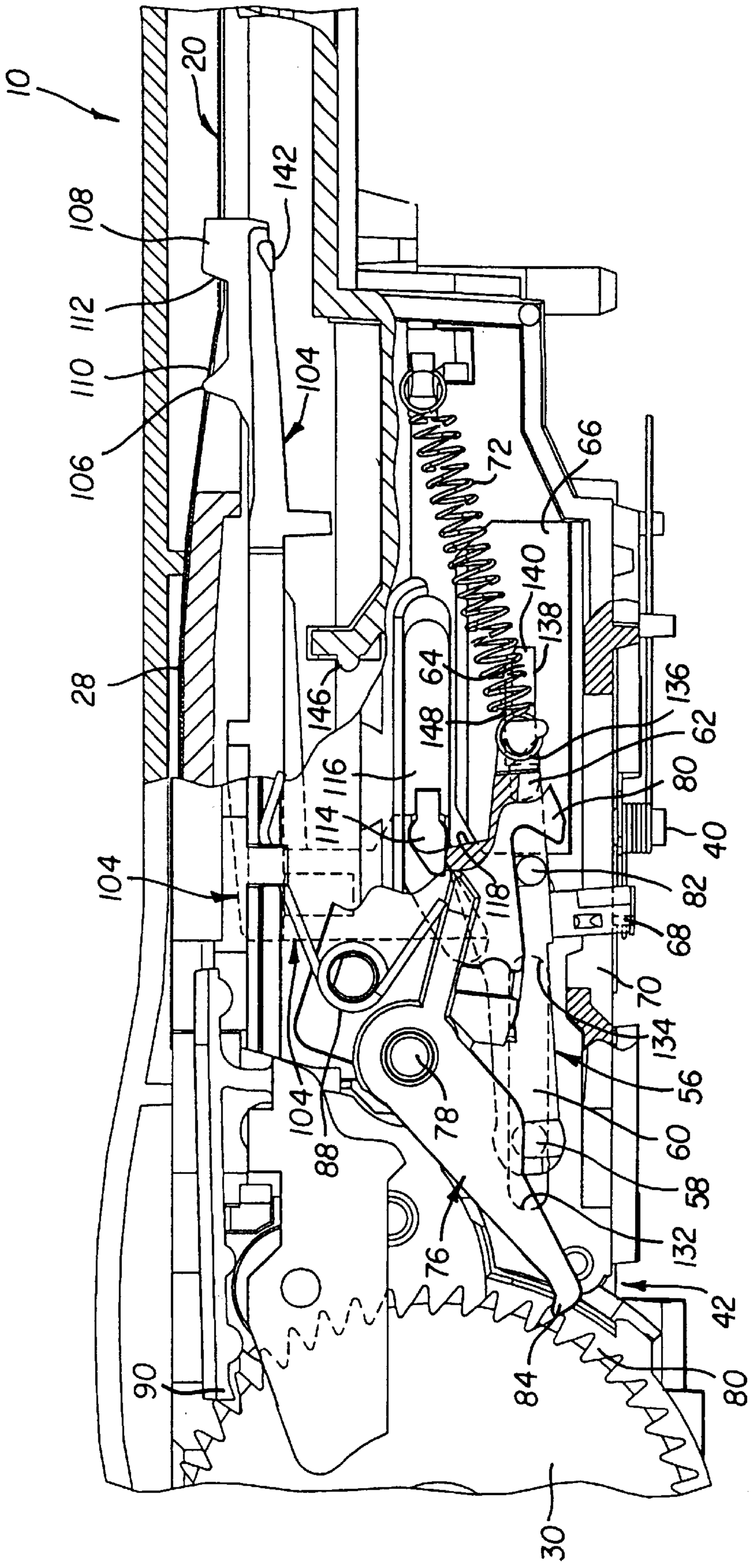
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FIG. 21

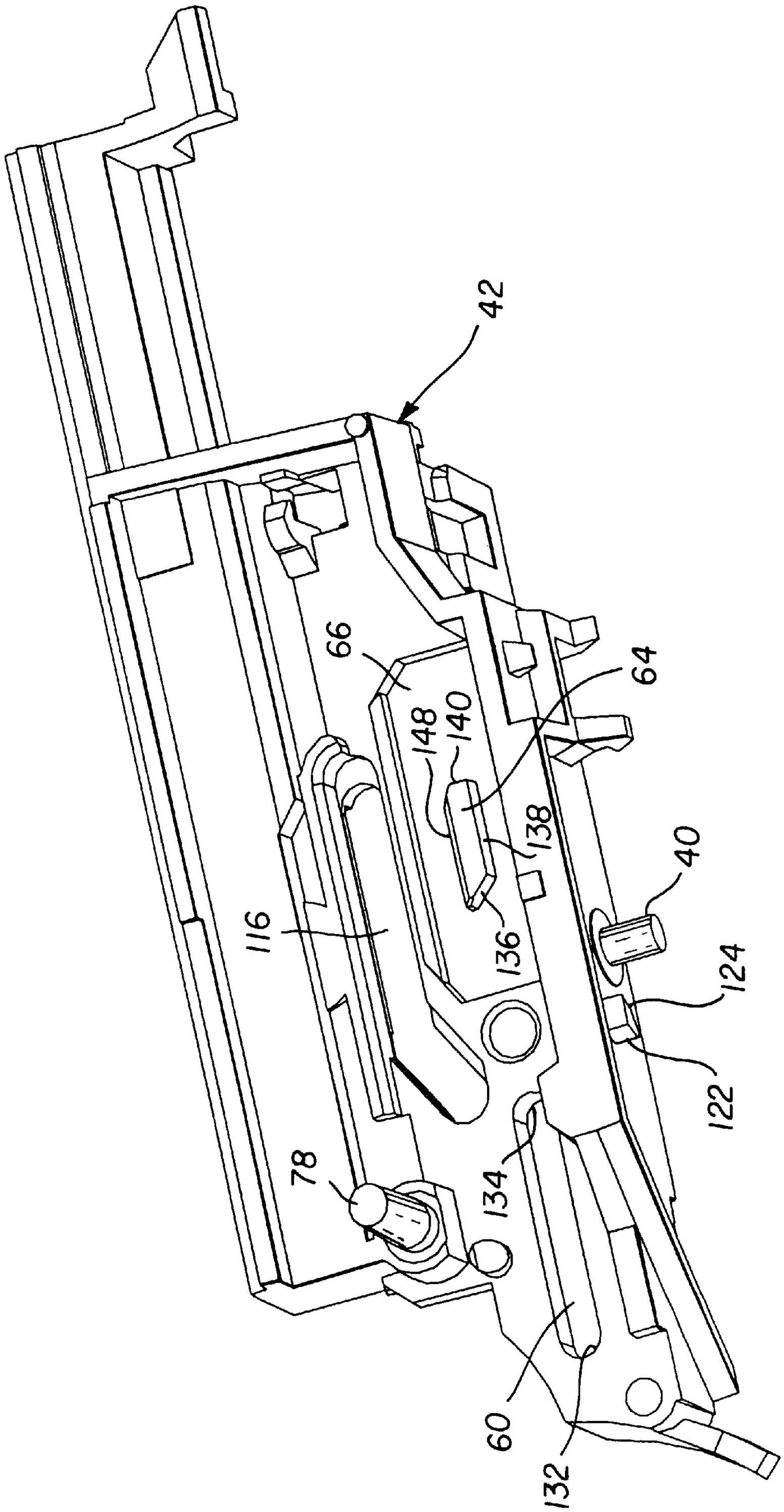

FIG. 22

CAMERA WITH FRAME SHIFT PREVENTION DURING EXPOSURE

CROSS-REFERENCE TO RELATED APPLICATION

Reference is made to commonly assigned, application Ser No. 09/283,719, entitled METERING/RE-COCKING MEMBER FOR ENGAGING FILM DURING EXPOSURE AND FOR RE-COCKING SHUTTER ACTUATOR, SEPARATES FROM SHUTTER ACTUATOR WHEN RE-COCKED and filed Apr. 1, 1999 in the name of Anthony DiRisio, now U.S. Pat. No. 6,092,936.

FIELD OF THE INVENTION

The invention relates generally to the field of photography, and in particular to cameras. More specifically, the invention relates to a camera with a film metering pawl that engages a filmstrip at a film perforation to prevent frame shift during exposure of a film frame.

BACKGROUND OF THE INVENTION

It is generally known for a camera to have a main body part with spaced film supply and film take-up chambers. An exposure opening is located between the film supply and take-up chambers and is configured for exposing successive film frames. A metering or sensing pawl is supported for engaging a film perforation during exposure of the film frame at the exposure opening. A film winding take-up is operated to move each exposed frame from the exposure opening to the film take-up chamber and to advance a fresh frame from the film supply chamber to the exposure opening. When the film metering pawl engages the film perforation, it is intended to prevent frame shift. The reason for this is that it is necessary to keep the film frame stationary during exposure.

Prior art U.S. Pat. No. 3,999,199 issued Dec. 21, 1976 discloses a camera in which a metering or sensing pawl is supported to engage a film perforation between the exposure opening and the film winding take-up during exposure of a film frame at the exposure opening. A compression spring urges the metering pawl opposite to the film take-up direction and towards the exposure opening, and therefore fails to tension the film frame at the exposure opening. Consequently, it is not clear whether frame shift during exposure may occur.

Prior art U.S. Pat. No. 5,708,888 issued Jan. 13, 1998 discloses a camera in which a cantilever beam has one end anchored to a film pressure plate and another end that is intended to engage a film perforation to prevent frame shift during exposure of a film frame. Presumably, a metering pawl or the equivalent is provided in addition to the cantilever beam.

—The Cross-Referenced Application—

The cross-referenced application discloses a camera including a shutter blade supported to move open to expose a frame on a filmstrip, a shutter actuator supported for movement to move the shutter blade open and for movement to be re-cocked, an actuating spring for urging the shutter actuator to move the shutter blade open, and a metering/re-cocking member having a metering pawl for engaging the filmstrip at a perforation during exposure of the frame. The metering/re-cocking member has a re-cocking portion and is supported for movement to move the re-cocking portion against the shutter actuator to move the shutter actuator to be re-cocked. A film tensioning spring urges the metering/re-cocking member, when the metering pawl engages the filmstrip at a perforation, to prevent the frame being exposed from shifting during exposure. The shutter actuator is supported for movement to be spaced from the metering/re-cocking member, when the shutter actuator is re-cocked, to prevent the actuating spring from exerting any influence on the metering pawl when the frame is exposed.

SUMMARY OF THE INVENTION

A camera comprising a main body part with spaced film supply and film take-up chambers and an exposure opening located between the film supply and take-up chambers and configured for exposing an unexposed film frame, a metering pawl for engaging a film perforation during exposure of the film frame at the exposure opening, and a film winding take-up for moving an exposed frame in a film take-up direction from the exposure opening to the film take-up chamber, is characterized in that:

the metering pawl is supported to engage a film perforation between the exposure opening and the film supply chamber during exposure of a film frame at the exposure opening; and

a tensioning spring urges the metering pawl substantially opposite to the film take-up direction in order to tension a film frame at the exposure opening.

Since the film length between the metering pawl and the film winding take-up is longitudinally tensioned, the film frame is similarly tensioned at the exposure opening. Thus, the film tensioning positively acts to prevent frame shift during exposure of the film frame.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front exploded perspective view of a camera according to a preferred embodiment of the invention;

FIG. **2** is a rear perspective view of the camera;

FIG. **3** is a partial-section, plan view of the camera with certain portions removed to facilitate illustration;

FIG. **4** is a front elevation view of the camera with certain portions removed to facilitate illustration;

FIG. **5** is similar to FIG. **3**, but is depicted when a shutter release button is manually depressed to initiate making an exposure;

FIG. **6** is similar to FIG. **4**, but corresponds in operation to FIG. **5**;

FIG. **7** is a continuation of operation from FIG. **5**;

FIG. **8** corresponds in operation to FIG. **7**;

FIG. **9** is a continuation of operation from FIG. **7**;

FIG. **10** corresponds in operation to FIG. **9**;

FIG. **11** corresponds in operation to FIG. **9**;

FIG. **12** is a continuation of operation from FIG. **11**;

FIG. **13** is a continuation of operation from FIG. **12**;

FIG. **14** is a continuation of operation from FIG. **10**;

FIG. **15** is a continuation of operation from FIG. **14**;

FIG. **16** is a continuation of operation from FIG. **15**;

FIG. **17** is a continuation of operation from FIG. **16**;

FIG. **18** is a continuation of operation from FIG. **17**;

FIG. **19** is a continuation of operation from FIG. **18**;

FIG. **20** is a continuation of operation from FIG. **19**;

FIG. **21** is a continuation of operation from FIG. **20**; and

FIG. **22** is a top perspective view of a support piece, shown from its top in FIG. **1**.

DETAILED DESCRIPTION OF THE INVENTION

The invention is disclosed as being embodied preferably in a relatively simple inexpensive camera such as a one-time-use camera. Because the features of a one-time-use camera are generally known, the description which follows is directed in particular only to those elements forming part of or cooperating directly with the disclosed embodiment. It is to be understood, however, that other elements may take various forms known to a person of ordinary skill in the art.

Referring now to the drawings, FIGS. **1–22** partially show a one-time-use camera **10**.

The one-time-use camera **10** is a simple point-and-shoot camera that includes an opaque plastic main body part **12** shown in FIGS. **1** and **2**. The main body part **12** has a rearwardly-open film take-up chamber **14** that contains a conventional film cartridge **16**, a rearwardly-open film supply chamber **18** that contains an unexposed filmstrip **20** which is prewound during camera manufacture from the film cartridge into an unexposed film roll **22** in the film supply chamber, and a rearwardly-open exposure opening **24** that is behind a front aperture **26** in the main body part. Ambient light passes through the front aperture **26** to the exposure opening **24** in order to expose successive frames **28** of the filmstrip **20**. A pair of opaque plastic front and rear cover parts (not shown) house the main body part **12** between them.

A film winding thumbwheel **30** is rotatably engaged with a film spool inside the film cartridge **16** in the film take-up chamber **14**. The film winding thumbwheel **30** is manually rotated in a circular film winding direction **32**, i.e. counter-clockwise in FIGS. **1** and **2**, to wind each frame **28** of the filmstrip **20** that is exposed at the exposure opening **24** into the film cartridge and to advance a fresh frame of the filmstrip from the unexposed film roll **22** to the exposure opening. As indicated in FIGS. **2** and **3**, the filmstrip **20** is incrementally moved in a substantially linear film take-up direction **34** from the film supply chamber **18**, across the exposure opening **24**, to the film take-up chamber **14**.

A fixed-focus taking lens **36** is held between a lens plate **38** and a lens retainer **39** which are connected together. The lens plate **38** is connected to the main body part **12** to position the taking lens **36** over the front aperture **26**.

A fixed pivot pin **40** on a support piece **42** which is fitted to the main body part **12** projects into a straight or slightly curved slot **44** in a shutter blade **46** to support the shutter blade for translation and pivoting. See FIG. **1**. The shutter blade **46** is pivoted open clockwise in FIGS. **8** and **11** and against a limit stop **48** on the main body part **12** to uncover the front aperture **26** in order to permit ambient light to pass from the taking lens **36**, through the front aperture, to the exposure opening **24** and is pivoted closed counter-clockwise in FIGS. **12** and **13** to re-cover the front aperture. A closing spring **50** biases the shutter blade **46** to be pivoted closed to re-cover the front aperture **26**. A light-intercepting rib **52** on the main body part **12** partially surrounds the shutter blade **46** when the shutter blade is closed as shown in FIG. **4**, and it has a blade stop end **54** against which the closing spring **50** urges the shutter blade.

A shutter actuator **56** has a bottom rear guide pin **58** that is confined to movement within a straight top slot **60** in the support piece **42**, a bottom front guide pin **62** that is confined to movement around an elongate island **64** within a top cavity **66** in the support piece, and an actuating striker **68** that protrudes outwardly from a straight front slot **70** in the support piece. See FIGS. **1**, **3**, **4** and **22**. A helical tension spring **72** spring biases the shutter actuator **56** substantially to the right in FIGS. **1** and **3** to advance the actuating striker **68** first against a tang **74** on the shutter blade **46**, and then over the tang, to pivot the shutter blade open to uncover the front aperture **26**. See FIGS. **6**, **8** and **11**.

A locking member **76** is supported for pivotal movement about a fixed pivot pin **78** on the support piece **42**. The locking member **76** has an actuator lock or catch **80** that engages the shutter actuator **56** at an upstanding post **82** on the shutter actuator to prevent the shutter actuator from being moved substantially to the right in FIGS. **1** and **3** via the helical tension spring **72**, and it has a rigid thumbwheel lock or pawl **84** that engages any one of a continuous array of peripheral teeth **86** on the film winding thumbwheel **30** to prevent the film winding thumbwheel from being manually rotated in the film winding direction **32**. A return spring **88** urges the locking member **76** to pivot clockwise in FIGS. **1** and **3** for the actuator lock **80** to engage the upstanding post **82** on the shutter actuator **56** and for the thumbwheel lock **84** to engage any one of the peripheral teeth **86** on the film winding thumbwheel **30**.

A resilient flexible anti-backup pawl **90** on a top piece **92** which is connected to the main body part **12** over the support piece **42** is inherently biased to engage any one of the peripheral teeth **88** on the film winding thumbwheel **30** to prevent reverse (unwinding) rotation of the film winding thumbwheel, i.e. rotation opposite to the film winding direction **32**. See FIGS. **1–3**.

A shutter release button **94** on the top piece **92** is resiliently cantilevered to permit it to be manually depressed to take a picture. The shutter release button **94** has a depending projection **96** that is swung against an upstanding projection **98** on the locking member **76**, when the shutter release button is manually depressed. This pivots the locking member **76** counter-clockwise in FIGS. **1**, **3** and **5**, for the actuator lock **80** to disengage from the upstanding post **82** on the shutter actuator **56** and for the thumbwheel lock **84** to disengage from any one of the peripheral teeth **86** on the film winding thumbwheel **30**.

A frame counter **100** for indicating the number of exposures remaining to be made on the filmstrip **20** is supported for rotation on the top piece **92**. See FIG. **1**. A direct see-through viewfinder **102** for viewing the subject to be photographed is positioned on the top piece **102**, beneath the frame counter **100**.

A metering/re-cocking member **104** is supported for movement between the main body part **12** and the support piece **42**. The metering/re-cocking member **104** has a film sensing pawl **106** and a film metering pawl **108** that are adapted to engage the filmstrip **20** at successive pairs of film perforations **110** and **112**. The film sensing pawl **106** and the film metering pawl **108** are fixed with respect to one another on the metering/re-cocking member **104**. A re-cocking projection **114** on the metering/re-cocking member **104** is confined to movement within a bent top slot **116** in the support piece **42** and is adapted to push against a front edge **118** of the shutter actuator **56** to re-cock the shutter actuator, i.e. to return the shutter actuator to its original position shown in FIGS. **3** and **4**, when each frame **28** of the filmstrip **20** that is exposed at the exposure opening **24** is wound into the film cartridge **16** and a fresh frame of the filmstrip is advanced from the unexposed film roll **22** to the exposure opening. That is, each time the filmstrip is moved in the film take-up direction **34**. See FIGS. **1–3** and **22**. A helical tension spring **120** biases the metering/re-cocking member **104** substantially to the right in FIGS. **1** and **3** and to the left in FIG. **2**.

A fixed blocking device **122** on the support piece **42** has an inclined blocking edge **124** which is positioned within a predetermined blocking range **126** of the shutter blade **46** to prevent the shutter blade from unintentionally being moved open to uncover the front aperture **26** when the shutter blade is moved accidentally due to mechanical shock, such as when the one-time-use camera **10** is dropped or jarred. The blocking range **126** is defined by a slight clearance space or gap **126** in FIG. **4** which is between the inclined blocking edge **122** and the shutter blade **46**. The clearance space **126** permits the shutter blade **46** to be pivoted open to uncover the front aperture **26** when the shutter actuator **56** is moved to pivot the shutter blade open (following manual depression of the shutter release button **94**). See FIG. **6**.

—Operation—

Beginning with FIGS. **1–5**, when the shutter release button **94** is manually depressed to take a picture, its depending projection **96** is swung against the upstanding projection **98** on the locking member **76**. This pivots the locking member counter-clockwise in FIG. **5**, for the actuator lock **80** to disengage from the upstanding post **82** on the shutter actuator **56** and for the thumbwheel lock **84** to disengage from any one of the peripheral teeth **86** on the film winding thumbwheel **30**.

The unexposed frame **28** of the filmstrip **20** which is at the exposure opening **24** is held steady over the exposure opening to prevent any frame shift, because the anti-backup pawl **90** is engaging one of the peripheral teeth **86** on the film winding thumbwheel **30** to prevent reverse (unwinding) rotation of the thumbwheel and the tension spring **120** urges the metering pawl **108** in the film perforation **112** substantially opposite to the film take-up direction **34**. Thus, the film frame **28** is longitudinally tensioned across the exposure opening **24** and any frame shift is precluded.

Next, in FIGS. **5** and **6**, the tension spring **72** moves the shutter actuator **56** initially to the right to advance the actuating striker **68** forward along the slot **70** in the support piece **42** to against the tang **74** on the shutter blade **46**. The shutter blade **46** is translated slightly to the right in FIG. **6** to change from a first closed end **128** of the slot **44** in the shutter blade being against the pivot pin **40** to a second closed end **130** of the slot being against the pivot pin. This moves the shutter blade **46** out of the blocking range **126** of the inclined blocking edge **124**, as can be seen by comparing FIGS. **4** and **6**. Also, the shutter blade **46** is slightly pivoted clockwise in FIG. **6** to separate from the blade stop end **54** of the light-intercepting rib **52**.

Then, in FIGS. **7–11**, the tension spring **72** moves the shutter actuator **56** further to the right to advance the actuating striker **68** forward along the slot **70** in the support piece **42** and over the tang **74** on the shutter blade **46**. This causes the shutter blade **46** to be pivoted open clockwise in FIGS. **8** and **11** and against the limit stop **48**, to uncover the front aperture **26**. The shutter blade **46** is pivoted open with the second closed end **130** of the slot **44** in the shutter blade being against the pivot pin **40**. Thus, the shutter blade **34** remains out of the blocking range **126** of the inclined blocking edge **124**. See FIGS. **7** and **11**.

By comparing FIGS. **3**, **5**, **7** and **9**, it can be seen that the bottom rear guide pin **58** on the shutter actuator **56** moves forward within the slot **60** in the support piece **42**, and the bottom front guide pin **62** on the shutter actuator moves forward within the cavity **66** in the support piece. The rear guide pin **58** moves from one end **132** of the slot **60** in FIG. **3** to an opposite end **134** of the slot in FIG. **9**. The front guide pin **62** moves from one end **136** of the island **64** in the cavity **66** in FIG. **3**, along a front side **138** of the island in FIGS. **5** and **7**, and around an opposite end **140** of the island in FIG. **9**. When the front guide pin **62** is moved to the opposite end **140** of the island **64**, the tension spring **72** can pivot the shutter actuator **56** counter-clockwise in FIG. **9** to retract the actuating striker **68** inwardly from the slot **70** in the support piece **42**. The actuating striker **68** is pivoted at its rear guide pin **58**. The actuating striker **68** must be retracted inwardly from the slot **70** to get out of the way of the tang **74** when the shutter blade **46** is pivoted closed to re-cover the front aperture **26**. Otherwise, the actuating striker **68** would block the tang **74** to prevent closing of the shutter blade **46**. Alternatively, the actuating striker **68** can be beveled on its underside to not block the tang **74** during closing of the shutter blade **46**.

As shown in FIG. **10**, the metering/re-cocking member **104** remains in the same position as in FIG. **3**, with the film sensing pawl **106** and the film metering pawl **108** engaging the filmstrip **20** at one pair of the film perforations **110** and **112**.

Next, in FIG. **12**, the closing spring **50** pivots the shutter blade **46** closed to re-cover the front aperture **26**. This is possible because the actuating striker **68** has been retracted inwardly from the slot **70** to get out of the way of the tang **74**. The shutter blade **46** is pivoted closed with the second closed end **130** of the slot **44** in the shutter blade being against the pivot pin **40** in FIG. **12**.

In FIG. **13**, the closing spring **50** pivots the shutter blade **46** slightly further to the blade stop end **54** of the light-intercepting rib **52** and then slightly about the blade stop end. This allows the closing spring **50** to translate the shutter blade **46** slightly to the left in FIG. **13** to change from the second closed end **130** of the slot **44** in the shutter blade being against the pivot pin **40** to the first closed end **128** of the slot being against the pivot pin. Then, as shown in FIG. **4**, the shutter blade **46** is returned to within the blocking range **126** of the inclined blocking edge **124**.

After the picture is taken, and before what is shown in FIG. **14**, the shutter release button **94** is manually released to end manual depression of the shutter release button. Thus, the depending projection **96** would be swung away from the upstanding projection **98** on the locking member **76**.

In FIG. **14**, the film winding thumbwheel **30** is begun to be manually rotated in the film winding direction **32** in order to wind the frame **28** of the filmstrip **20** that is exposed at the exposure opening **24** into the film cartridge **16** and to advance a fresh frame of the filmstrip from the unexposed film roll **22** to the exposure opening. Since the filmstrip **20** is moved in the film take-up direction **34**, the film perforation **110** begins to separate from the film sensing pawl **106** of the metering/re-cocking member **104** as shown in FIG. **14**. However, the film metering pawl **108** of the metering/re-cocking member **104** remains in the film perforation **112**. Thus, the metering/re-cocking member **104** is moved slightly to the left in FIG. **14**, stretching the tension spring **120**. The re-cocking projection **114** on the metering/re-cocking member **104** is similarly moved within the bent top slot **116** in the support piece **42** as shown in FIG. **14**.

In FIG. **15**, the film winding thumbwheel **30** is further rotated in the film winding direction **32**, and a follower **142** on the metering/re-cocking member **104** moves along a fixed cam **144** on the support piece **42** to cause the metering/re-cocking member to move slightly to the left and downward in FIG. **15**, separating the film metering pawl **108** of the metering/re-cocking member **104** from the film perforation

112. Simultaneously, the re-cocking projection **114** on the metering/re-cocking member **104** is similarly moved within the bent top slot **116** in the support piece **42** as shown in FIG. **15**.

In FIGS. **16** and **17**, the film winding thumbwheel **30** is further rotated in the film winding direction **32**, and the tension spring **120** returns the metering/re-cocking member **104** to the right to re-position the film sensing and metering pawls **106** and **108** of the metering/re-cocking member against the filmstrip **20**. At this time, the film sensing and metering pawls **106** and **108** tend to bear lightly against the filmstrip **20** due to the urging of the tension spring **120**.

In FIG. **18**, the film winding thumbwheel **30** is further rotated in the film winding direction **32**, and the film sensing and metering pawls **106** and **108** of the metering/re-cocking member **104** drop into another (the next) pair of the film perforations **110** and **112** to re-engage the filmstrip **20**. The metering/re-cocking member **104** is pivoted slightly counter-clockwise in FIG. **18** about a fixed nub **146** on the support piece **42**.

In FIG. **19**, the film winding thumbwheel **30** is further rotated in the film winding direction **32**, which causes the metering/re-cocking member **104** to again begin to move to the left (since the film sensing and metering pawls **106** and **108** of the metering/re-cocking member **104** are now in another pair of the film perforations **110** and **112**). This moves the re-cocking projection **114** on the metering/re-cocking member **104** against the front edge **118** of the shutter actuator **56** to begin to re-cock the shutter actuator, i.e. to begin to return the shutter actuator to its original position shown in FIGS. **3** and **4**. The upstanding post **82** on the shutter actuator **56** bears against the actuator lock **80** on the locking member **76** to pivot the locking member slightly counter-clockwise in FIG. **19**, which serves to decrement the frame counter **100** by "1." The front guide pin **62** on the shutter actuator **56** is moved from the end **140** of the island **64** in the cavity **66** in the support piece **42** to along a rear side **148** of the island. The actuating striker **68** therefore remains retracted inwardly from the slot **70** in the support piece **42**. This allows the shutter actuator **56** to be re-cocked, i.e. returned to its original position shown in FIGS. **3** and **4**, without the tang **74** on the shutter blade **46** obstructing the actuating striker **68**.

In FIG. **20**, the film winding thumbwheel **30** is further rotated in the film winding direction **32**, and the metering/re-cocking member **104** is further moved to the left. Movement of the metering/re-cocking member **104** further to the left in FIG. **20** causes the re-cocking projection **114** on the metering/re-cocking member to push the front edge **118** of the shutter actuator **56** to continue to re-cock the shutter actuator, i.e. to continue to return the shutter actuator to its original position shown in FIGS. **3** and **4**. Also, the front guide pin **62** on the shutter actuator **56** is moved from the rear side **148** of the island **64** in the cavity **66** in the support piece **42** to the end **136** of the island.

When the front guide pin **62** on the shutter actuator **56** is moved to the end **136** of the island **64** in the cavity **66** in the support piece **42**, the return spring **88** can begin to pivot the locking member **76** clockwise in FIG. **21**. One edge of the locking member **76** then begins to push against the upstanding post **82** on the shutter actuator **56** to begin to pivot the shutter actuator **56** clockwise in FIG. **21**. Thus, in FIG. **21**, the front edge **118** of the shutter actuator **56** separates from the re-cocking projection **114** on the metering/re-cocking member **104**, and the front guide pin **62** on the shutter actuator begins to be moved around the end **136** of the island **64** in the cavity **66** in the support piece **42**. The return spring **88** continues to pivot the locking member **76** clockwise in FIG. **21**. Consequently, the thumbwheel lock **84** begins to engage any one of the peripheral teeth **86** on the film winding thumbwheel **30**, and the actuating striker **68** begins to re-enter the slot **70** in the support piece **42** (ahead of the tang **74** on the shutter blade **46**) as shown in FIGS. **3** and **4**.

Finally, in FIG. **3**, the actuator lock **80** re-engages the upstanding post **82** on the shutter actuator **56** to prevent the shutter actuator from being moved substantially to the right in FIG. **3** via the spring **72**. The re-cocking projection **114** on the metering/re-cocking member **104** is kept spaced from the front edge **118** of the shutter actuator **56**, which prevents the tension spring **72** for the shutter actuator from having any affect on the metering/re-cocking member **104**. This is important because the film sensing and metering pawls **106** and **108** of the metering/re-cocking member **104** are then in a pair of the film perforations **110** and **112**. If the film sensing and metering pawls **106** and **108** were continuously subjected to the urging of the spring **72**, in addition to that of the spring **120**, when the pawls are in a pair of the film perforations **110** and **112**, the filmstrip **20** would be tensioned too much.

When the one-time-use camera **10** is dropped or jarred, the mechanical shock may cause the shutter blade **46** to be slightly pivoted clockwise in FIG. **4** to separate from the blade stop end **54** of the light-intercepting rib **52**. The closing spring **50** maintains the first closed end **128** of the slot **44** in the shutter blade against the pivot pin **40**. Consequently, the shutter blade **46** is pivoted against the inclined blocking edge **124** (closing the slight space **126** which is shown in FIG. **4**) to prevent the shutter blade from being pivoted open to uncover the front aperture **26**. Then, the closing spring **50** returns the shutter blade **46** to against the blade stop end **54** of the light-intercepting rib **52** and separates the shutter blade from the inclined blocking edge **124** (re-effecting the slight space **126** as shown in FIG. **4**).

The invention has been described with reference to a preferred embodiment. However, it will be appreciated that variations and modifications can be effected by a person of ordinary skill in the art without departing from the scope of the invention.

PARTS LIST

10. one-time-use camera
12. main body part
14. film take-up chamber
16. film cartridge
18. film supply chamber
20. filmstrip
22. unexposed film roll
24. exposure opening
26. front aperture
28. film frames
30. film winding thumbwheel
32. film winding direction
34. film take-up direction
36. taking lens
38. lens plate
39. lens retainer
40. pivot pin
42. support piece
44. slot
46. shutter blade
48. limit stop
50. closing spring

52. light-intercepting rib
54. blade stop end
56. shutter actuator
58. rear guide pin
60. slot
62. front guide pin
64. island
66. cavity
68. actuating striker
70. slot
72. tension spring
74. tang
76. locking member
78. pivot pin
80. actuator lock
82. upstanding post
84. thumbwheel lock
86. peripheral teeth
88. return spring
90. anti backup pawl
92. top piece
94. shutter release button
96. depending projection
98. upstanding projection
100. frame counter
102. viewfinder
104. metering/re-cocking member
106. film sensing pawl
108. film metering pawl
110. film perforation
112. film perforation
114. re-cocking projection
116. slot
118. front edge
120. tension spring
122. blocking device
124. inclined blocking edge
126. blocking range/clearance space
128. first closed end
130. second closed end
132. one end
134. opposite end
136. one end
138. front side
140. opposite end
142. follower
144. cam
146. nub
148. rear side

What is claimed is:

1. A camera comprising a main body part with spaced film supply and film take-up chambers and an exposure opening located between said film supply and take-up chambers and configured for exposing an unexposed film frame, a metering pawl for engaging a film perforation during exposure of the film frame at said exposure opening, and a film winding take-up for moving an exposed frame in a film take-up direction from said exposure opening to said film take-up chamber, is characterized in that:

said metering pawl is supported to engage a film perforation between said exposure opening and said film supply chamber during exposure of a film frame at said exposure opening; and

a tensioning spring urges said metering pawl substantially opposite to the film take-up direction in order to tension a film frame at said exposure opening, to prevent frame shift during exposure of the film frame.

2. A camera as recited in claim **1**, wherein said film winding take-up includes a film winding thumbwheel rotatable in a film winding direction to move an exposed frame in the film take-up direction and into a film cartridge in said take-up chamber, and an anti-backup pawl engages said film winding thumbwheel to prevent reverse rotation of the film winding thumbwheel when said tensioning spring urges said metering pawl substantially opposite to the film take-up direction in order to tension a film frame at said exposure opening.

3. A camera as recited in claim **2**, a thumbwheel lock engages said film winding thumbwheel to prevent rotation of the film winding thumbwheel in the film winding direction and is movable out of engagement with the film winding thumbwheel, and a shutter release button is manually depressible to initiate exposure of a film frame at said exposure opening and move said thumbwheel lock out of engagement with said film winding thumbwheel.

4. A camera as recited in claim **3**, wherein said anti-backup pawl engages said film winding thumbwheel when said thumbwheel lock is moved out of engagement with said film winding thumbwheel.

5. A camera as recited in claim **1**, wherein a film sensing pawl is fixed with respect to said metering pawl and is supported to engage a film perforation when said metering pawl engages a film perforation during exposure of a film frame at said exposure opening, and said tensioning spring urges said film sensing pawl substantially opposite to the film take-up direction in order to tension the film frame at said exposure opening.

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